ProCAL

Small Engine EFI Calibration Tool

ECOTRONS

User Manual

V2.8.3

All Rights Reserved

Copyright ECOTRON LLC

Revision History

Data	Revision Level	Description
May 2012	V 2.6	PRELIMINARY
May 2012	V2.7	Second Amendment
August 2012	V2.8.0	new Version
September 2012	V2.8.1	Minor corrections,
September 2012	V2.8.2	rearrange the order of chapters
Jan 2013	V2.8.3	Add Chapter 7: Frequently Asked Questions

Note:

ProCAL software is the intellectual properties of ECOTRON LLC, it's not allowed to re-produce or re-distribute without approval of ECOTRON LLC.

Web: Http://www.ecotrons.com

Email: info@ecotrons.com

Table of Contents

Chapter 1 Installation 5

1.1 Install the new version: 5

Chapter 2 Start ProCAL 9

2.1 Start ProCAL 9

Chapter 3 Run the ProCAL 11

3.1 Load the files 11

3.2 Select the communication mode between ProCAL and ECU 12

3.2.1 Open the Communication Setting Window 12

3.2.2 Configure the Communications 12

3.3 Connect 15

3.3.1 Establish the communication 15

3.3.2 Compare the CAL files 16

3.4 Gauges 17

3.4.1 Gauge Display 17

3.4.2 Gauge Setting 18

3.5 List of variables 19

3.5.1 List Display 19

3.5.2 Add Variables in the List 20

3.6 Virtual Oscilloscope 24

3.6.1 Select Signals 24

3.6.2 Start Measuring 24

3.6.3 Change the Max/Min range 25

3.6.4 Lost of Communications 26

3.7 Record Data and Play-back 26

3.7.1 Start Recording 26

3.7.2 Stop Recording 27

3.7.3 Play Back 27

Chapter 4 Change Calibrations (Tuning) 31

4.1 Change system parameters 31

4.2 Tune calibration VALUE, CURVE, or MAP 31

4.3 Export / Import Calibration Data 33

4.4 Save the calibrations 36

4.5 Activate the new Calibrations 36

4.6 Burn to ECU or Fetch form ECU....37
4.7 Decimal display....37
4.8 Signal/Parameter properties....39

Chapter 5 Diagnosis....41

5.1 Get the DTC of ECU....41
5.2 Failed to connect to the ECU....42

Chapter 6 Uninstall the ProCAL....46

Chapter 7 Frequently Asked Questions....47

7.1 How to compare and copy a file....47
7.2 Record Data....55
7.3 Connection ALM to ECU....56
7.4 Auto-tuning Function....56
7.4.1 How it works?....57
7.4.2 How to use?....57
7.4.3 How effective is it?....59

Chapter 1 Installation

1.1 Install the new version:

You must uninstall the old version before install the new version!

Usually the latest and greatest version is downloadable at our website:

www.ecotrons.com/support

Ask us if you are not sure whether your ProCAL software is up to date or not: info@ecotrons.com

1) In case the version in your CD is out of date, use the latest downloaded from our website. Or email us for the newer version.
2) In case the ProCAL is sent you in a .ZIP or .RAR format, please unzip it and store to the folder to your D:\ drive somewhere and install from there, instead of installing from the ZIP folder.
3) Install ProCAL by run the "ProCAL-setup.exe" in the folder.

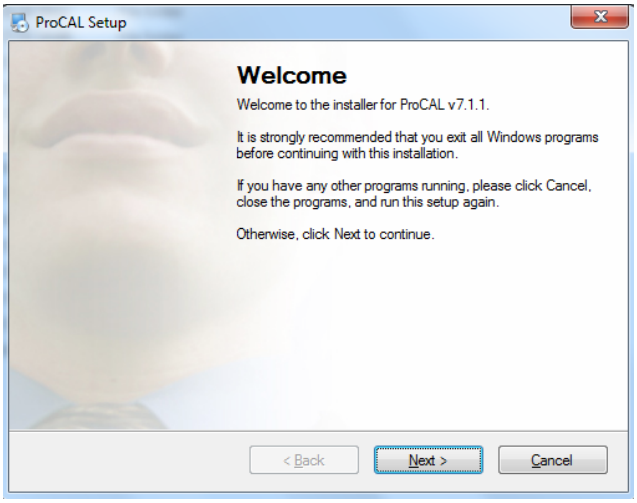

ProCAL Setup
Welcome
Welcome to the installer for ProCAL v7.1.1.
It is strongly recommended that you exit all Windows programs before continuing with this installation.
If you have any other programs running, please click Cancel, close the programs, and run this setup again.
Otherwise, click Next to continue.
< Back
Next >
Cancel

Figure1.1 Step 1 of Installation

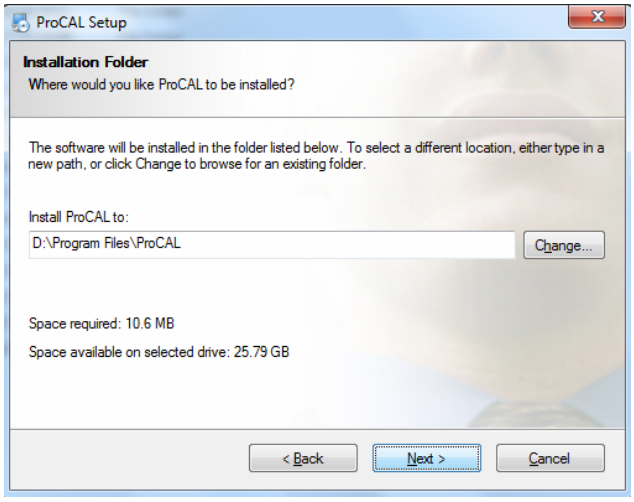

ProCAL Setup
Installation Folder
Where would you like ProCAL to be installed?
The software will be installed in the folder listed below. To select a different location, either type in a new path, or click Change to browse for an existing folder.
Install ProCAL to:
D:\Program Files\ProCAL
Change...
Space required: 10.6 MB
Space available on selected drive: 25.79 GB
< Back
Next >
Cancel

Figure1.2 Step 2 of Installation

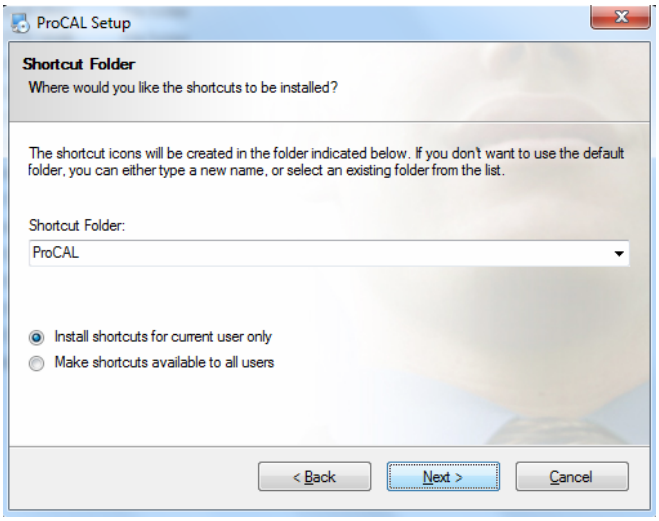

ProCAL Setup
Shortcut Folder
Where would you like the shortcuts to be installed?
The shortcut icons will be created in the folder indicated below. If you don't want to use the default folder, you can either type a new name, or select an existing folder from the list.
Shortcut Folder:
ProCAL
Install shortcuts for current user only
Make shortcuts available to all users
< Back
Next >
Cancel

Figure1.3 Step 3 of Installation

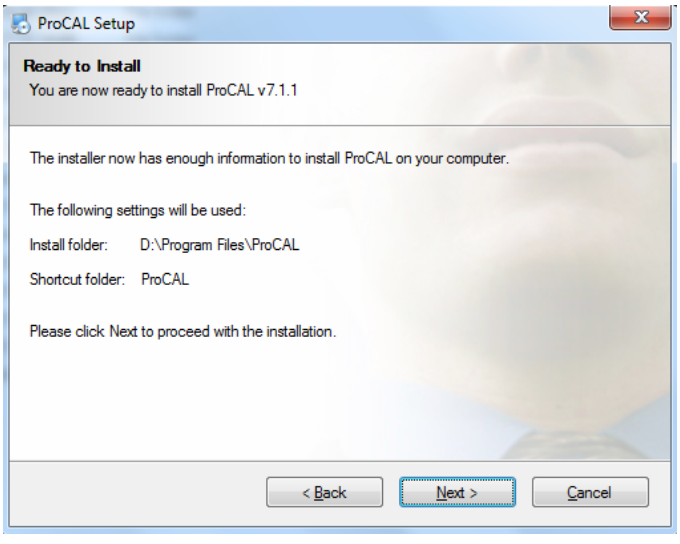

ProCAL Setup
Ready to Install
You are now ready to install ProCAL v7.1.1
The installer now has enough information to install ProCAL on your computer.
The following settings will be used:
Install folder: D:\Program Files\ProCAL
Shortcut folder: ProCAL
Please click Next to proceed with the installation.
< Back
Next >
Cancel

Figure1.4 Step 4 of Installation

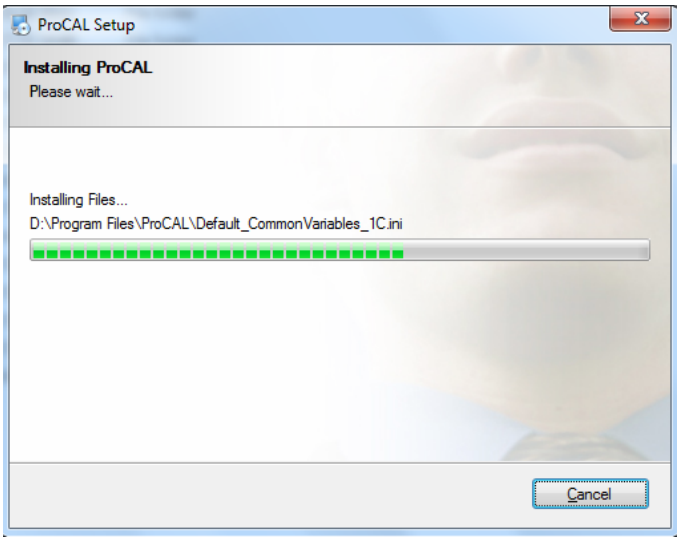


Figure1.5 Step 5 of Installation

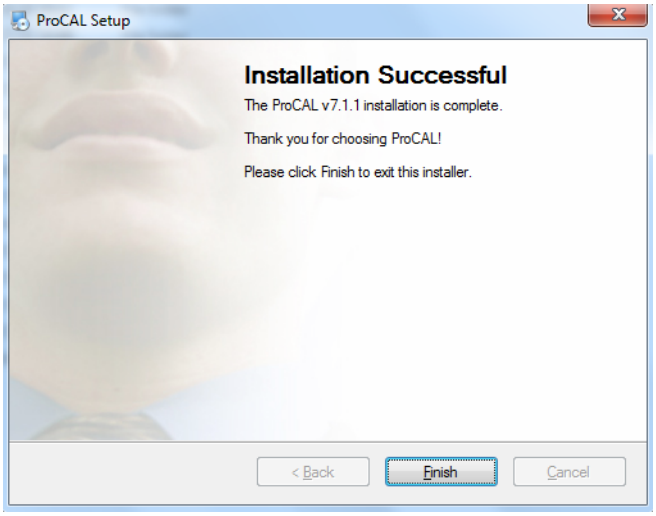


Figure1.6 Step 6 of Installation

Win7 or Windows Vista users:

ProCAL does not work well with Windows Vista or Win7. We are still working on the issue. At the moment, we recommend you to set the ProCAL in the "Win XP compatibility mode", by doing the below:

1. Right click on the ProCAL icon on Desktop or Programs
2. Choose properties
3. Click compatibility tab
4. Check: Run this program in compatibility mode
5. Choose XP service pack 2
6. Check: run this program as administrator
7. Apply

Chapter 2 Start ProCAL

2.1 Start ProCAL

Run the software, ProCAL, from "**Windows Start → Program → ProCAL**" or click the shortcut of desktop:

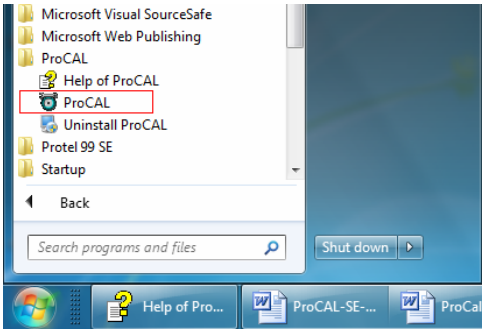


Figure 2.1.1 stating form the Windows Start

Figure 2.1.2 stating form the desktop

The default ProCAL window will be look like below:

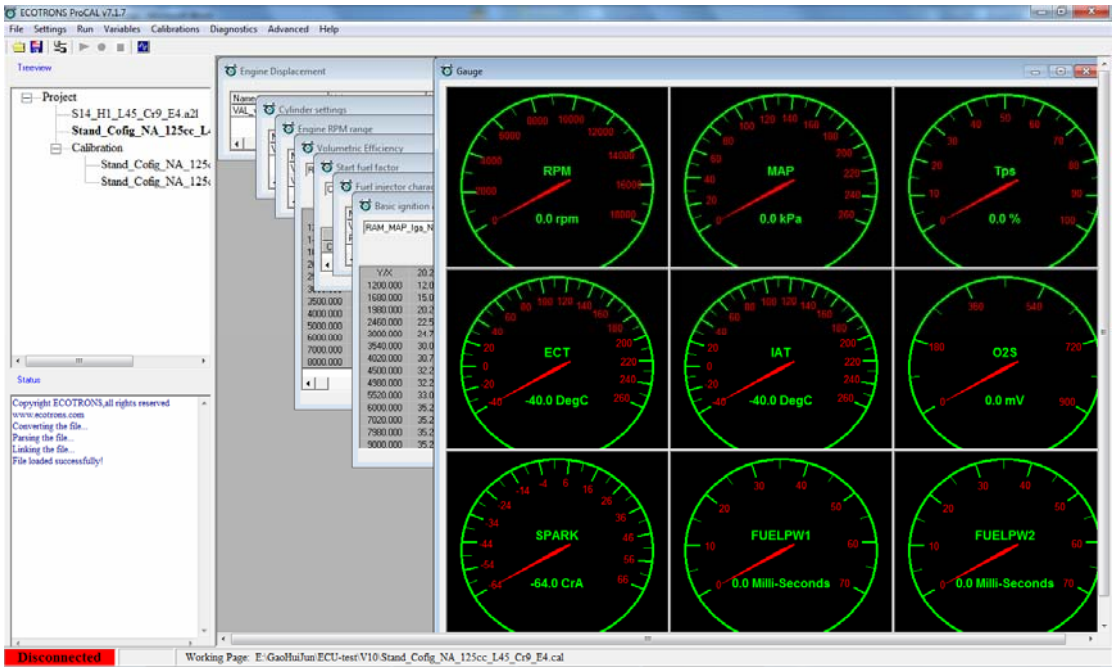


Figure 2.1.3 ProCAL window

- Upper left area: project tree structure
- Lower left area: status of the running program
- Right area: variables display window, calibrations edit window, etc.

Chapter 3 Run the ProCAL

3.1 Load the files

S19 file: this is a Motorola format microprocessor executable file;

A2L file: this is a description file that contains the ECU info for ProCAL;

CAL file: this is a calibration data file that contains parameters users can tune. CAL file is one part of the S19 file.

Note: most customers don't need the S19 file; unless an ECU software update is necessary;

It is enough to have the A2L file and CAL file to run ProCAL and tune your engines.

First time running ProCAL, it will automatically load some default configuration files like an ECU description **A2L** file and an ECU calibration file **CAL** file, for example, as in the below figure:

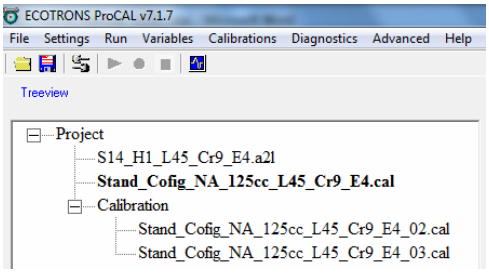


Figure 3.1.1 A2L file and CAL file

If ProCAL does NOT automatically load the default configuration, likely you do not have the necessary A2L file and CAL file, in the folder of "**D:\Program Files\ProCAL**", which is your installation destination folder. You should copy and paste the necessary A2L file and CAL file into that folder, if the folder contains no such files.
If you have not got A2L file and CAL file in your CD or the software package via Email, please contact us: **info@ecotrons.com**

Often the user will need to load different A2L file and CAL file than the default ones coming with the ProCAL. For example, a software update or new calibration release will give you new A2L file and CAL file.
To load the new A2L file and CAL file, in ProCAL, go to "**File Open**", and then go to the right folder and select the files.

3.2 Select the communication mode between ProCAL and ECU

3.2.1 Open the Communication Setting Window

Select the ProCAL menu bar **Settings** **Communication setting**, the user can open the **Communication Settings** window.

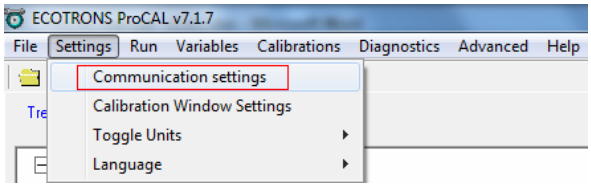


Figure 3.2.1.1 Communication Settings window

3.2.2 Configure the Communications

ProCAL has four kinds of communication modes, **USB, COM, Bluetooth** and **Ethernet**. The user can choose the correct setting according to the real hardware connection between the laptop and the ECU.

By default, ProCAL select USB communication mode (**Note: insert the Ecotrons' USB adaptor into the laptop**). This configuration is consistent with most of the computers.

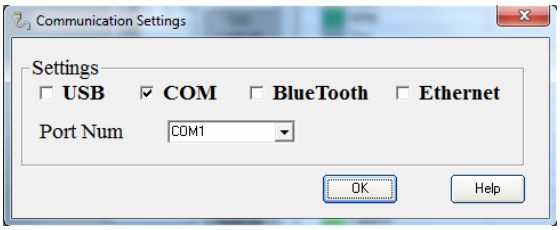


Figure 3.2.2.1

If the user is using the COM mode (**Note: your laptop should have a built-in COM port**), select the ProCAL menu bar **Settings** **Communication setting**. Select COM and set the COM port, the default COM port is **COM1**. (**Note:** To check the computer COM port to check method, see 5.2 failed to connect to the ECU**)**

Figure 3.2.2.2 Built-in COM port (9-pin)

The default baud rate is 115200, which the fastest of serial comm. rate of the PC. It is not supposed to change.

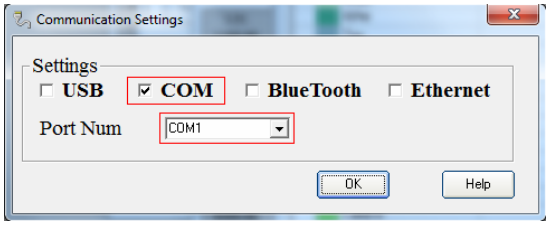


Figure 3.2.2.3 Select the COM port

Most new computers do NOT have a built-in COM port any more. You should insert the USB to RS232 adaptor (Ecotrons' USB Adaptor, Figure 3.2.2.4) to the laptop, and then select the **USB** in the communication settings window of ProCAL (Figure 3.2.2.5).

Figure 3.2.2.4 USB to COM modal

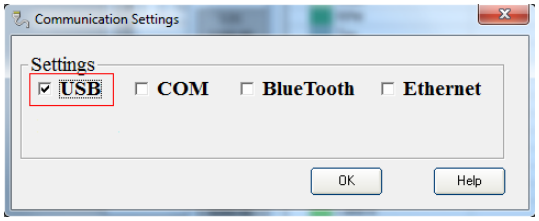


Figure 3.2.2.5 Select the USB

Note: If the user's Bluetooth module is not Ecotrons, baud rate must be set to 115200.

If the user is using Bluetooth communication, you need to determine the laptop supports Bluetooth

function. select the ProCAL menu bar **Settings** **Communication setting**, Select BlueTooth.

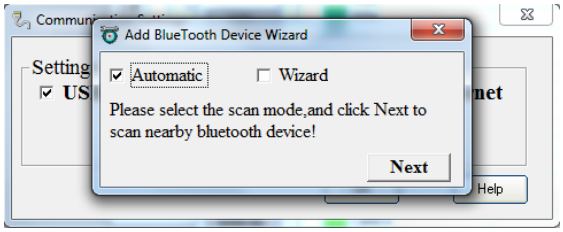


Figure 3.2.2.6 Select the BlueTooth

If you use the Ecotrons Bluetooth module, you can select Automatic mode. Otherwise, select Wizard mode. In the Automatic mode, click Next, ProCAL will automatically try and ECU connected. If you can not connect, please select Wizard mode, and follow the prompts to manually connect.

If you select the Wizard mode, click next, will pop-up BluetoothFinder_MFC window. Click Next button, the program will search local Bluetooth

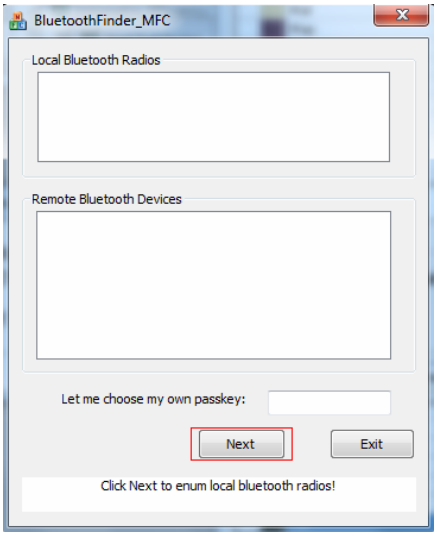


Figure 3.2.2.7 BluetoothFinder_MFC window

After the search is complete, BluetoothFinder_MFC will list the available Bluetooth. Select a Bluetooth signal, and then click next.

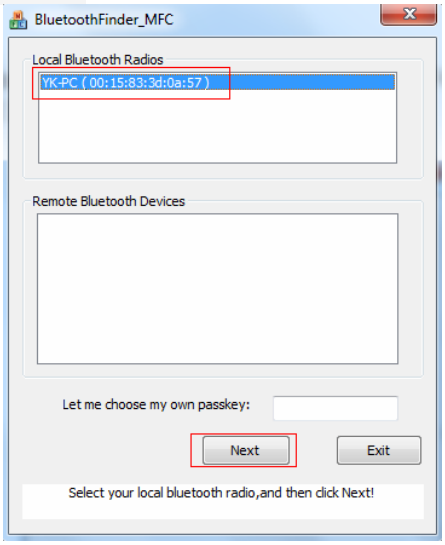


Figure 3.2.2.7 BluetoothFinder_MFC window

BluetoothFinder_MFC began to search for a matching Bluetooth signal, once found, click on the search for the Bluetooth signal, and then click Next to connect. If you are using the Ecotrons Bluetooth module, the default name is Ecotronsxxx (xxx: serial number), the default password is 1234.
If you can not connect successfully, please try again.

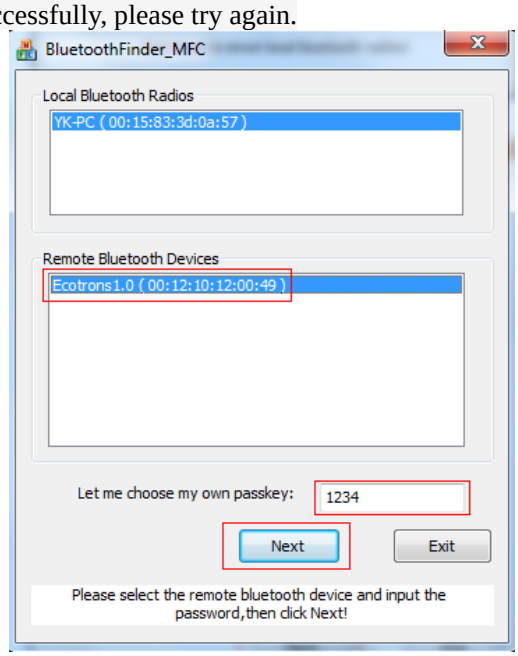


Figure 3.2.2.8 Matching Bluetooth

3.3 Connect

Note1: Please confirm the ECU is powered on (The fuel pump will make some noises when key-on!)
Note2: Please confirm you select the correct way of communication mode (USB/COM/Bluetooth/Ethernet)!

3.3.1 Establish the communication

(If you have multiple CAL files in the project tree, the left window, you may want to highlight the desired **CAL** file). Go to menu "Run connect", ProCAL will try to establish the communication between the laptop and the ECU. If the **A2L** file you loaded in the ProCAL does not match the software that is pre-loaded in the ECU, you will be prompted "Software mismatch!" And you either need to load the correct **A2L** file into ProCAL, or you have to flash the ECU with the matching software file (contact us for the correct **ECU S19** file).

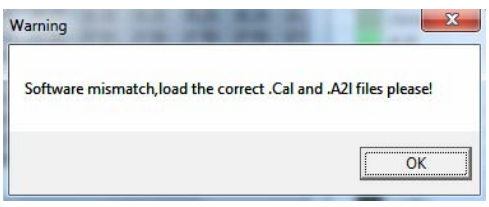
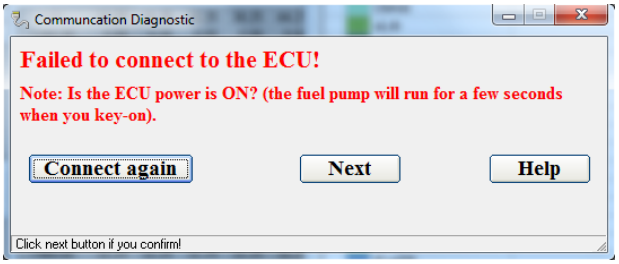


Figure 3.3.1.1

If failed to connect to the ECU, see 5.2 failed to connect to the ECU


Communcation Diagnostic
Failed to connect to the ECU!
Note: Is the ECU power is ON? (the fuel pump will run for a few seconds when you key-on).
Connect again
Next
Help
Click next button if you confirm!

3.3.1.2 Failed to connect to the ECU

3.3.2 Compare the CAL files

Once the communication is established, the ProCAL will compare the calibration data, or the CAL file loaded in ProCAL against the CAL file pre-loaded in the ECU. If the calibration data are different, you will get a prompt to either download the Cal file ***("Burn to ECU"***), or upload the Cal file ("***Fetch from ECU"***).

Note: in many applications, to keep the user interface simple, we disabled the "***Fetch from ECU"***; because you don't need it in most cases.

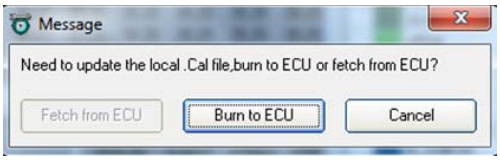


Figure 3.3.2.1

Otherwise, the status window will show "Data is latest!"

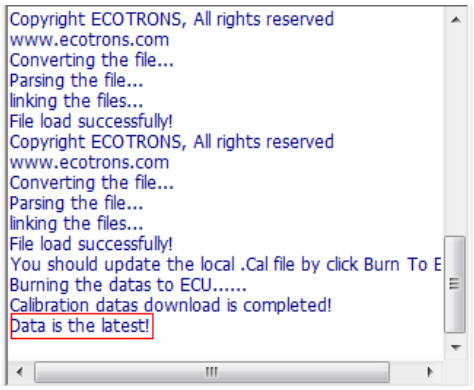


Figure 3.3.2.2 Data is latest

Note: make sure your 12V battery is healthy, before you do any download and upload!
During the upload or download, users are not allowed to do any operations to the EFI system.
Do not turn off the ECU power or disconnect the serial cable before the upload/download is finished

3.4 Gauges

3.4.1 Gauge Display

The default way of the real-time display is a group of gauges (when the ProCAL starts up), you can also change it by the calibration window settings!

1) Click the ProCAL menu bar and select **Settings** **Calibration Window Settings**, open the **Calibration Window Settings** window.

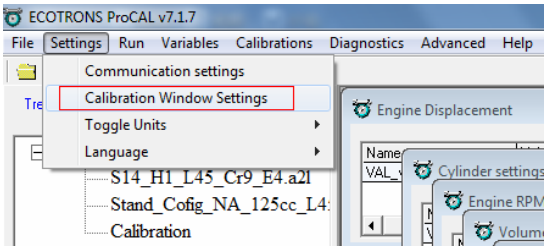


Figure 3.4.1.1

2) Select **Gauge**, and then click **OK**.

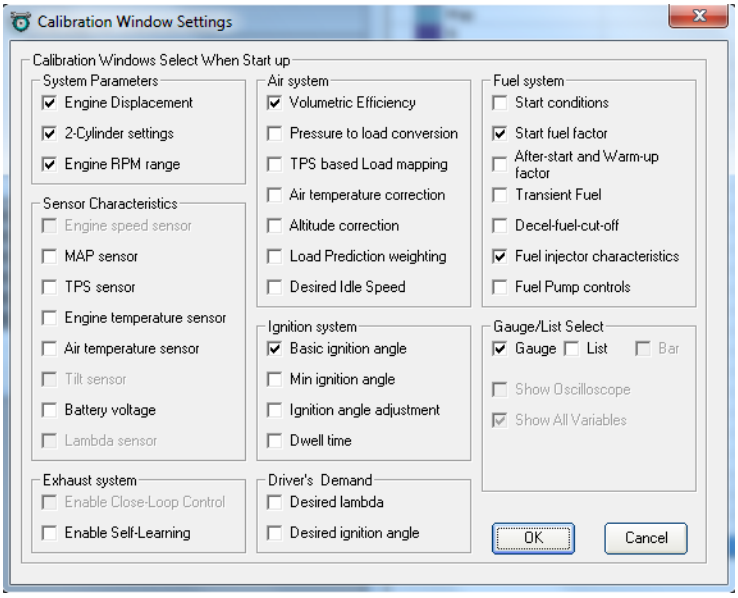


Figure 3.4.1.2

3) The next time you start ProCAL, the Gauge window will be displayed by default.

Note: if you closed the Gauge window. You can select the PrcCAL menu bar **Variables** **Display Type Gauge** or right-click the ProCAL window at the blank area and selects **Display Type Gauge** to show Gauge window.

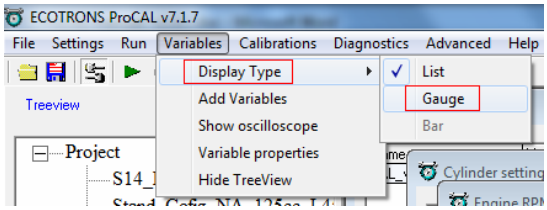


Figure 3.4.1.3

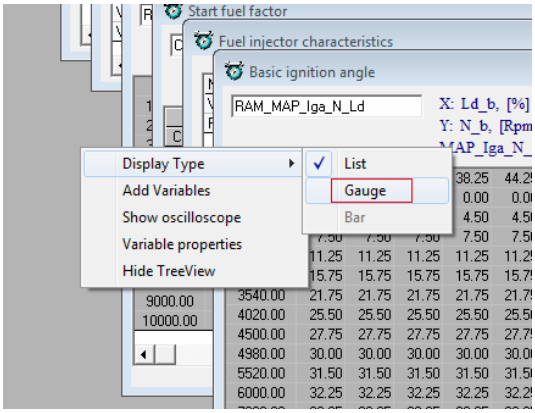


Figure 3.4.1.4

3.4.2 Gauge Setting

1) As shown in Figure 3.4.2.1, Right click on a gauge in the window.

Figure 3.4.2.1

2) Select **Change Max/Min Value** option, pop up the **Change Max/Min Value** window. Then input data, and click **OK**, your changes will take effect. Your changes will be retained, until restarting ProCAL.

Figure 2.1.6

3.5 List of variables

3.5.1 List Display

The default way of real-time display is the gauge (when the ProCAL starts up), you can also change it to a list of variables by selecting the calibration window settings!

1) Click the ProCAL menu bar and select **Settings** **Calibration Window Settings**.

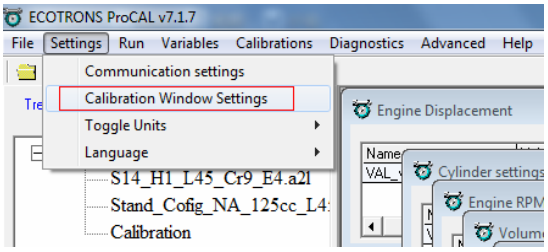


Figure 3.5.1.1

2) As shown in Figure 2.3.2, Select **List**, and then click **OK**.

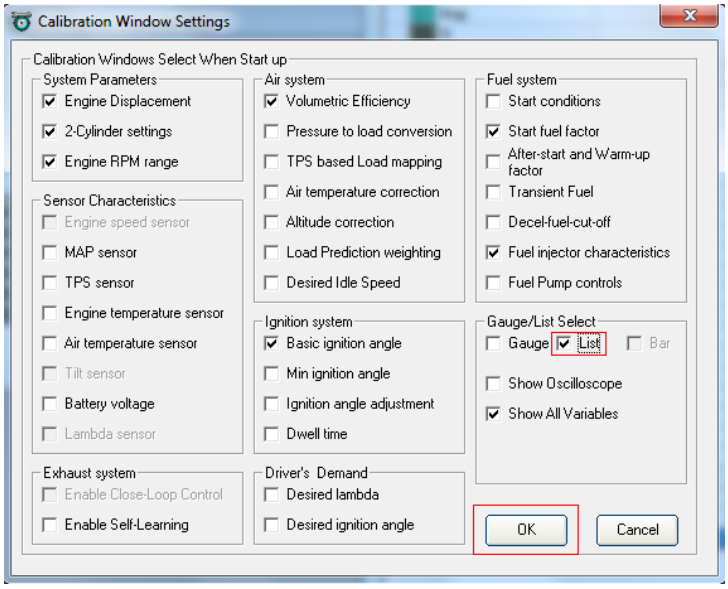


Figure 3.5.1.2

3) ProCAL list window will be displayed by default for the next startup, shown as below: One reason to change to the List window is to make more variables visible!

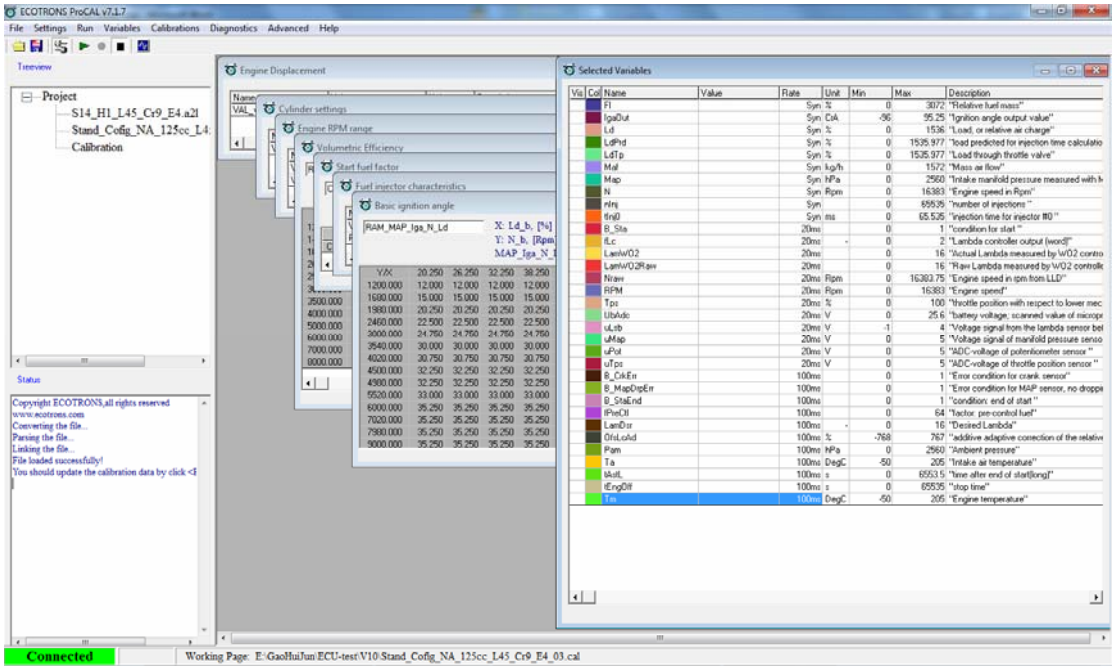


Figure 3.5.1.3

Note: if you have closed the List window. You can recover it by selecting the PrcCAL menu bar **Variables** **Display Type List** or right-click the ProCAL window blank area and selecting **Display Type List.**

3.5.2 Add Variables in the List

By default only about 60 variables are displayed in the List window. ECU has more than a

thousand variables that can be displayed. You can use "Add Variables" to add the new variables to be visible and at the same time to be logged.

1) As shown in Figure 3.5.2.1, right click in the **Selected Variables** window and open the **Add Variables** window.

You can also click ProCAL menu bar **variables** **add variables**, open the **Add Variables** window

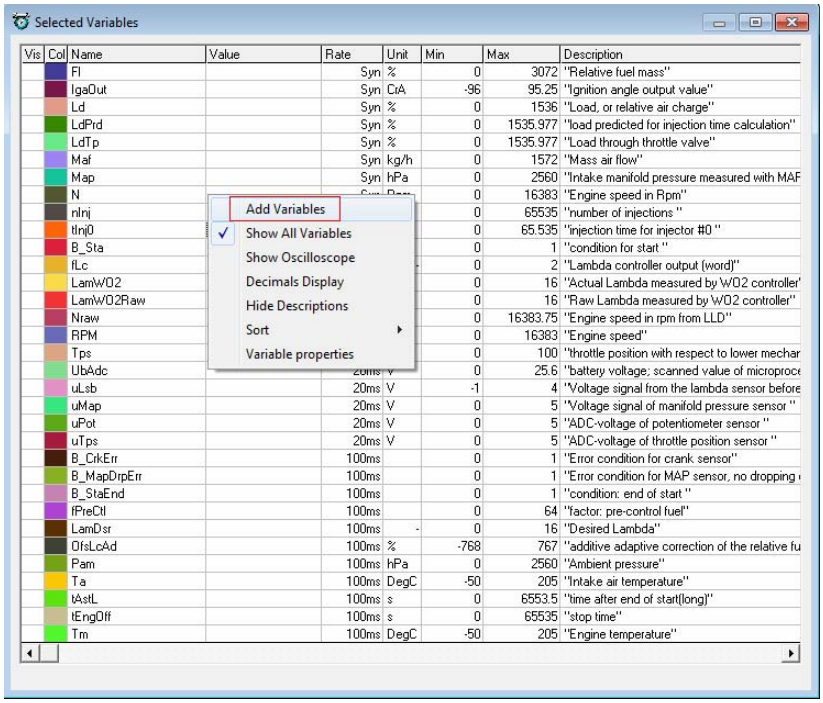

Selected Variables
Vis Col Name Value Rate Unit Min Max Description
FI Syn % 0 3072 "Relative fuel mass"
IgaOut Syn CrA -96 95.25 "Ignition angle output value"
Ld Syn % 0 1536 "Load, or relative air charge"
LdPrd Syn % 0 1535.977 "load predicted for injection time calculation"
LdTp Syn % 0 1535.977 "Load through throttle valve"
Maf Syn kg/h 0 1572 "Mass air flow"
Map Syn hPa 0 2560 "Intake manifold pressure measured with MAF
N 0 16383 "Engine speed in Rpm"
nInj 0 65535 "number of injections "
tInj0 0 65.535 "injection time for injector #0 "
B_Sta 0 1 "condition for start "
fLc 0 2 "Lambda controller output (word)"
LamWO2 0 16 "Actual Lambda measured by WO2 controller"
LamWO2Raw 0 16 "Raw Lambda measured by WO2 controller"
Nraw 0 16383.75 "Engine speed in rpm from LLD"
RPM 0 16383 "Engine speed"
Tps 0 100 "throttle position with respect to lower mechar
UbAdc 0 25.6 "battery voltage; scanned value of microproce
uLsb 20ms V -1 4 "Voltage signal from the lambda sensor before
uMap 20ms V 0 5 "Voltage signal of manifold pressure sensor "
uPot 20ms V 0 5 "ADC-voltage of potentiometer sensor "
uTps 20ms V 0 5 "ADC-voltage of throttle position sensor "
B_CrkErr 100ms 0 1 "Error condition for crank sensor"
B_MapDrpErr 100ms 0 1 "Error condition for MAP sensor, no dropping
B_StaEnd 100ms 0 1 "condition: end of start "
fPreCtl 100ms 0 64 "factor: pre-control fuel"
LamDsr 100ms 0 16 "Desired Lambda"
OfsLcAd 100ms % -768 767 "additive adaptive correction of the relative fu
Pam 100ms hPa 0 2560 "Ambient pressure"
Ta 100ms DegC -50 205 "Intake air temperature"
tAstL 100ms s 0 6553.5 "time after end of start(long)"
tEngOff 100ms s 0 65535 "stop time"
Tm 100ms DegC -50 205 "Engine temperature"
Add Variables
Show All Variables
Show Oscilloscope
Decimals Display
Hide Descriptions
Sort
Variable properties

Figure 3.5.2.1

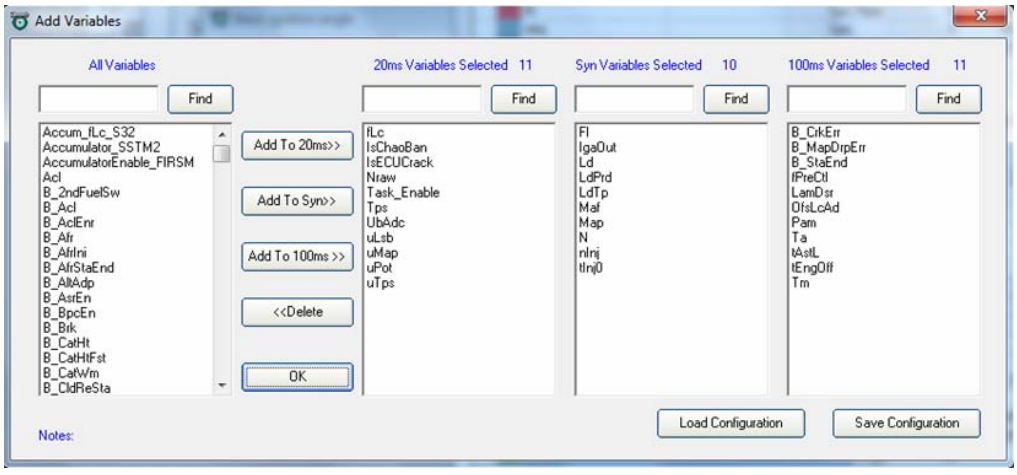


Figure 3.5.2.2 Add Variables

The user can add / delete the variables to be displayed on the screen, as many as possible. But the total number of variables is recommended to be about 80 ones. Too many variables in display or logging, will adversely affect your software running speed, and even could cause a crash on a slow computer.

Once you select certain numbers of variables, you can save your configuration (the list of variables) in an INI file. You can load the saved Configuration later to have the same list of variables always.

The variables can be updated in 3 rates: **20ms, 100ms**, and **Syn**.

The "Syn" rate means it is synchronized with the engine speed. It will be logged for every revolution of the engine.

Use your understanding of the engine operations to pick the rates for the variables. You can use 20ms for all variables as a start.

A good practice is to use the default setting of the variables and only add the ones that you really need.

Use a good combination of 20ms, 100ms, and syn rates for the variables will give you the most benefits of the throughput.

Note the total number of variables that can be displayed/logged will be limited by the throughput of the serial communication bus. However you will not run into this situation until you start to use advanced features and display more than ~100 variables.

2) How to add variables

Select the variable name. And then pick one of the rates: **Add To 20ms, Add To 100ms,** or **Add To Syn.** Click the **OK** button, the variables will be added to the **Selected Variables** window.

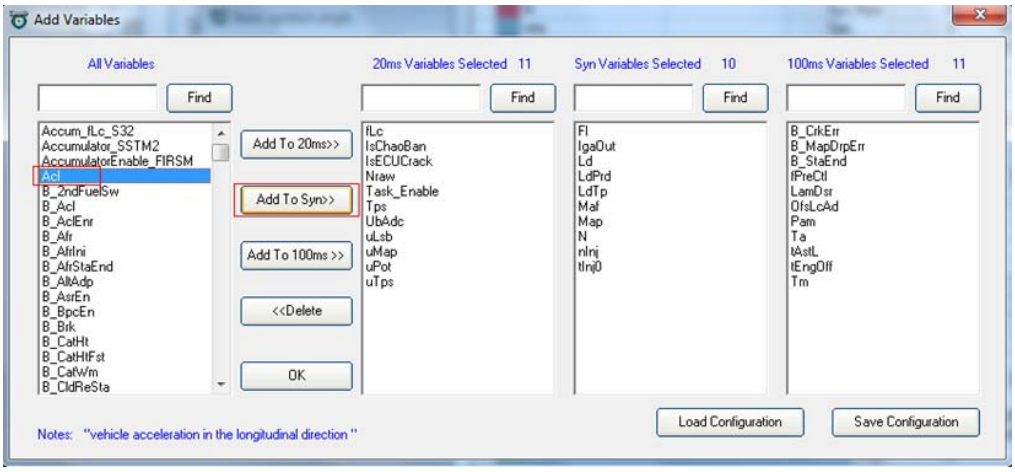


Figure 3.5.2.3 Add variables

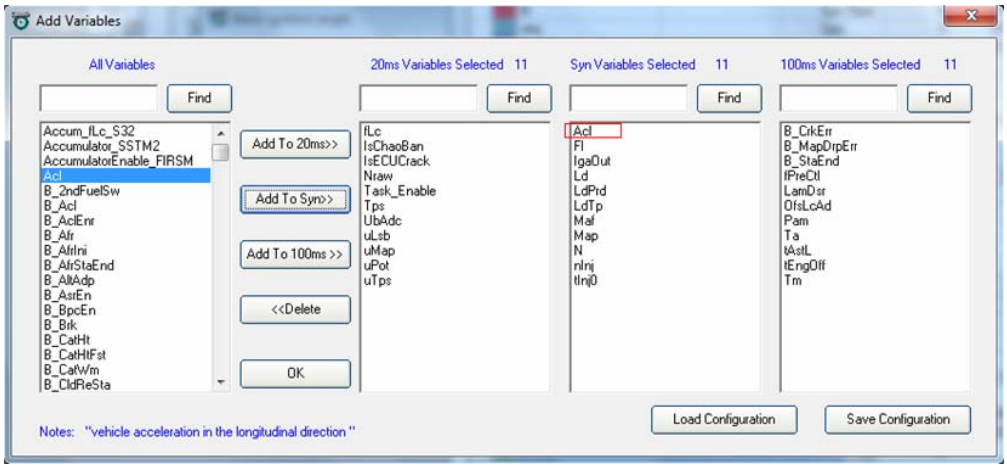


Figure 3.5.2.4 Add variables

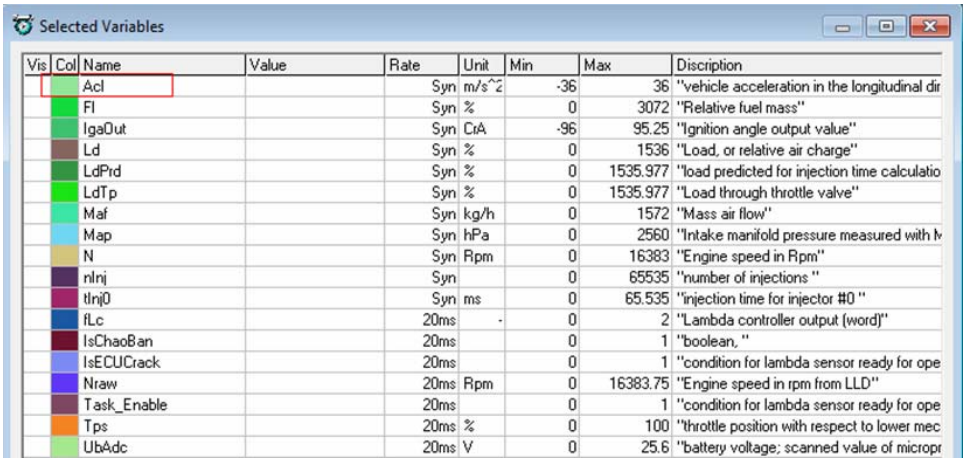

Selected Variables
Vis Col Name Value Rate Unit Min Max Discription
Acl Syn m/s^2 -36 36 "vehicle acceleration in the longitudinal dir
Fl Syn % 0 3072 "Relative fuel mass"
IgaOut Syn CrA -96 95.25 "Ignition angle output value"
Ld Syn % 0 1536 "Load, or relative air charge"
LdPrd Syn % 0 1535.977 "load predicted for injection time calculatio
LdTp Syn % 0 1535.977 "Load through throttle valve"
Maf Syn kg/h 0 1572 "Mass air flow"
Map Syn hPa 0 2560 "Intake manifold pressure measured with M
N Syn Rpm 0 16383 "Engine speed in Rpm"
nInj Syn 0 65535 "number of injections "
tInj0 Syn ms 0 65.535 "injection time for injector #0 "
fLc 20ms - 0 2 "Lambda controller output (word)"
IsChaoBan 20ms 0 1 "boolean, "
IsECUCrack 20ms 0 1 "condition for lambda sensor ready for ope
Nraw 20ms Rpm 0 16383.75 "Engine speed in rpm from LLD"
Task_Enable 20ms 0 1 "condition for lambda sensor ready for ope
Tps 20ms % 0 100 "throttle position with respect to lower mec
UbAdc 20ms V 0 25.6 "battery voltage; scanned value of micropr

Figure 3.5.2.5 Add variables

Note: if you can not find the variable you just added, you may still in the "Show basic variables" setting. You need to right-clicking the **Selected Variables** window and select **Show All Selected Variables**.

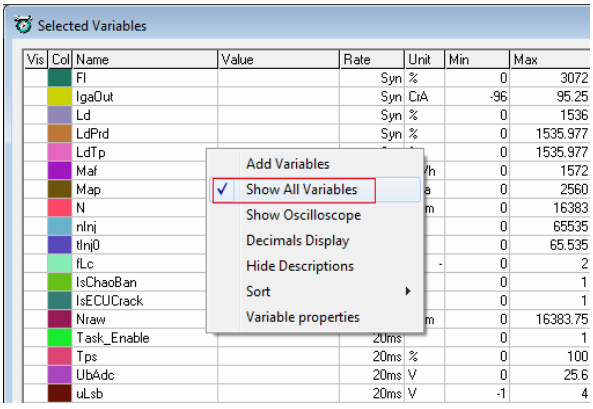


Figure 3.5.2.6 Show All Variables

3.6 Virtual Oscilloscope

3.6.1 Select Signals

The user can select **Variables** **Show Oscilloscope** or right-click the ProCAL window at the blank area selects **Show Oscilloscope**.

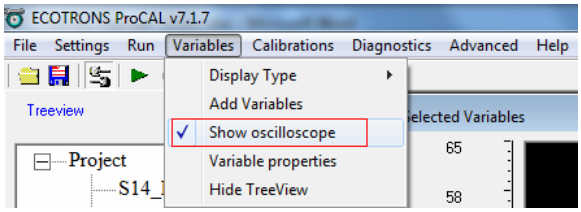


Figure 3.6.1.1

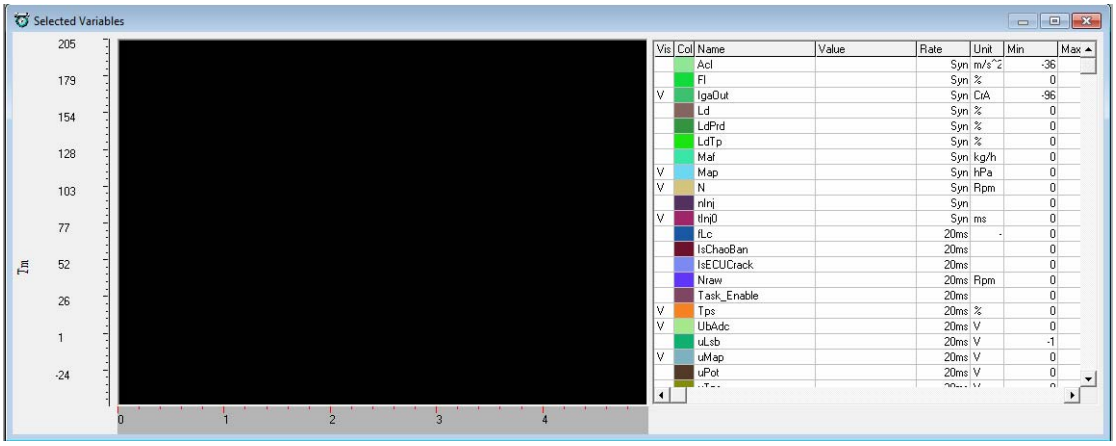


Figure 3.6.1.2 Oscilloscope window

3.6.2 Start Measuring

Once the display settings are done, the user can select **Run** **Connect** **Start Measuring** or click the button to start reading real-time data from ECU.

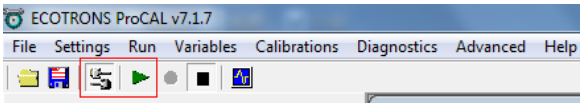


Figure 3.6.2.1

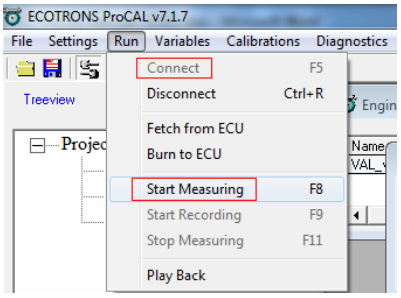


Figure 3.6.2.2

The left side of signal window is the graph area, which plots the curves of the signals in the real-time manner.

If you want to show a certain variable in the virtual scope, click "V" in front of the variable. Unchecked variables will NOT show in the virtual scope.

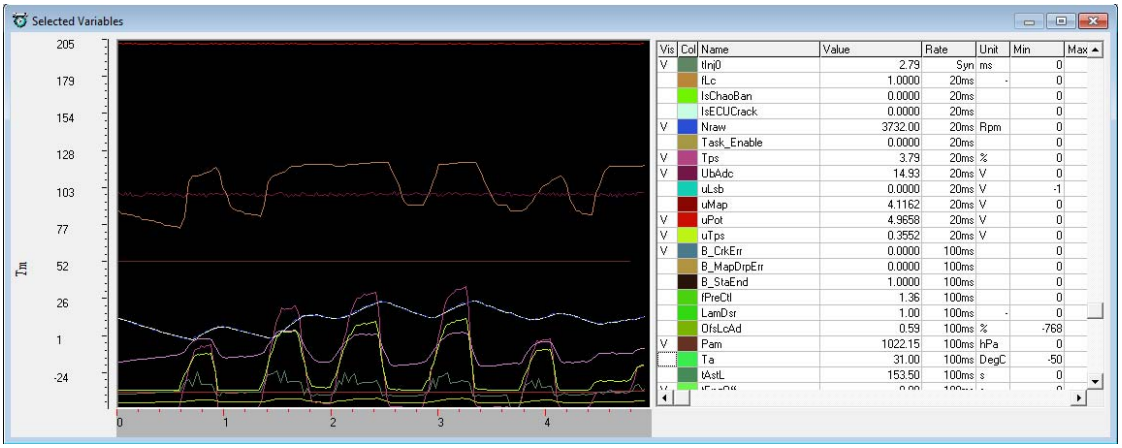
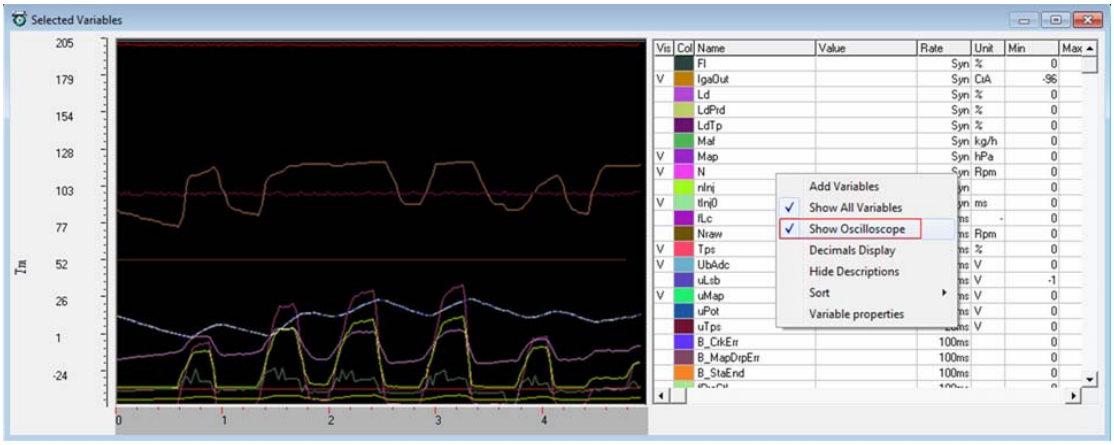

Selected Variables
Vis Col Name Value Rate Unit Min Max
tInj0 2.79 Syn ms 0
fLc 1.0000 20ms 0
IsChaoBan 0.0000 20ms 0
IsECUCrack 0.0000 20ms 0
Nraw 3732.00 20ms Rpm 0
Task_Enable 0.0000 20ms 0
Tps 3.79 20ms % 0
UbAdc 14.93 20ms V 0
uLsb 0.0000 20ms V -1
uMap 4.1162 20ms V 0
uPot 4.9658 20ms V 0
uTps 0.3552 20ms V 0
B_CrkErr 0.0000 100ms 0
B_MapDrpErr 0.0000 100ms 0
B_StaEnd 1.0000 100ms 0
fPreCtl 1.36 100ms 0
LamDsr 1.00 100ms 0
OfsLcAd 0.59 100ms % -768
Pam 1022.15 100ms hPa 0
Ta 31.00 100ms DegC -50
tAstL 153.50 100ms s 0

Figure 3.6.2.3

If you want to show/hide the graph area, first click on the button ■ to stop the measurement, and then right-click in the window, select **show oscilloscope**.



3.6.2.4

3.6.3 Change the Max/Min range

The user can modify the max / min values in the variable list, to **zoom in/zoom out** the Y-axis of the specific signals.

Double-click to modify the max/min values, type in the value you want, Press the Enter key, modification will take effect successfully.

Vis	Col	Name	Value	Rate	Unit	Min	Max	Discriptic
		Acl		Syn	m/s^2	-36	36	"vehicle
		Fl		Syn	%	0	3072	"Relative
V		IgaOut		Syn	CrA	-96	95.25	"Ignition
		Ld		Syn	%	0	1536	"Load, o
		LdPrd		Syn	%	0	1535.977	"load pre
		LdTp		Syn	%	0	1535.977	"Load th
		Maf		Syn	kg/h	0	1572	"Mass ai
V		Map		Syn	hPa	0	2560	"Intake r
V		N		Syn	Rpm	0	16383	"Engine
		nInj		Syn		0	65535	"number
V		tInj0		Syn	ms	0	65.535	"injectior
		fLc	1.0000	20ms	-	0	2	"Lambda
		IsChaoBan	0.0000	20ms		0	1	"boolear
		IsECUCrack	0.0000	20ms		0	1	"conditio
		Nraw	0.00	20ms	Rpm	0	16383.75	"Engine
		Task_Enable	1.0000	20ms		0	1	"conditio
V		Tps	0.00	20ms	%	0	100	"throttle
V		UbAdc	12.75	20ms	V	0	25.6	"battery
		uLsb	0.4529	20ms	V	-1	4	"Voltage
V		uMap	4.9707	20ms	V	0	5	"Voltage
		uPot	4.9646	20ms	V	0	5	"ADC-vo

Figure 3.6.3.1

If the data is not in the range, ProCAL will show a warning box.

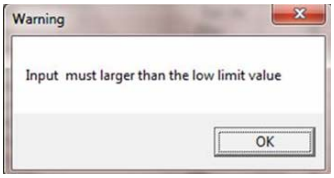


Figure 3.6.3.2

3.6.4 Lost of Communications

If ProCAL does not receive the data from ECU in two seconds, the ProCAL will show a warning, indicating the loss of communications.

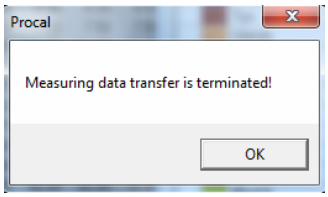


Figure 3.6.4.1

3.7 Record Data and Play-back

3.7.1 Start Recording

During the real-time data display, the user can select "**Run Start Recording**", or click the button to start recording the data in the PC.

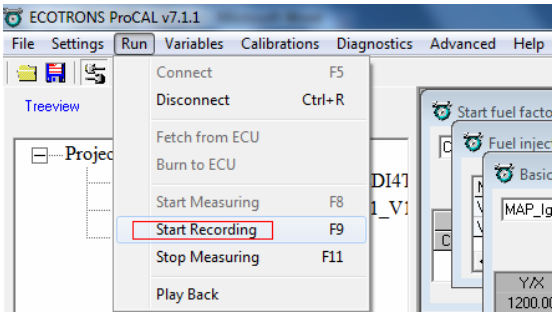


Figure 3.7.1.1

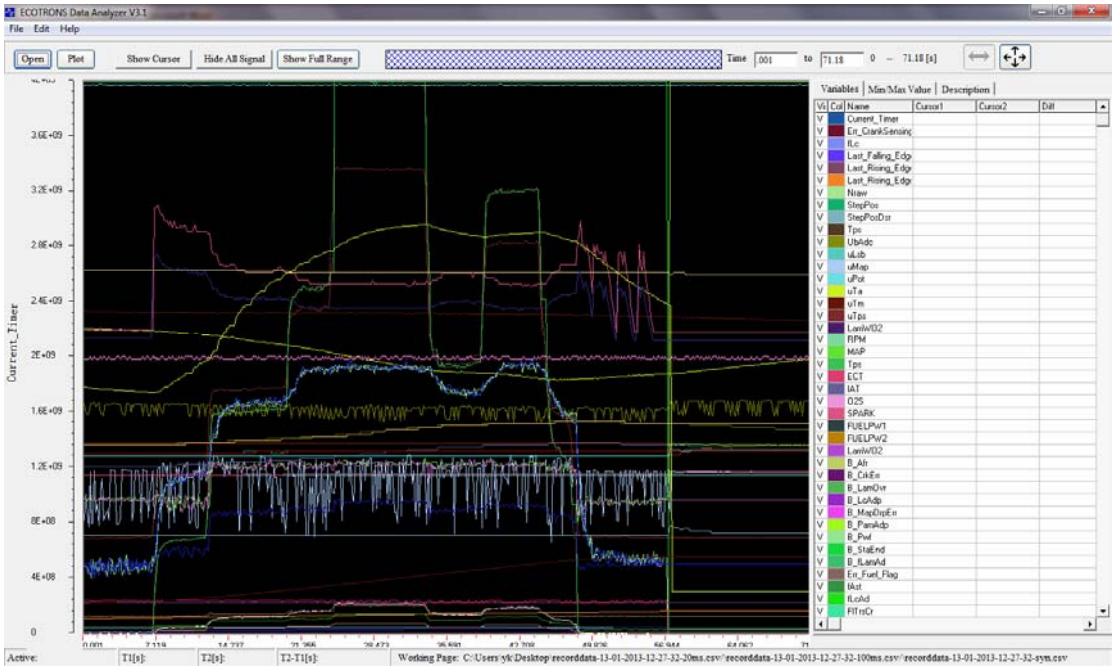
3.7.2 Stop Recording

When you want to stop the recording, go to menu and select "**Run Stop Measuring**" or click the button ■ to stop. Then ProCAL will prompt to the user to give a file name to save the data.

3.7.3 Play Back

After the data file is saved, the user can select "**Run** `Play Back`" or click the button to play back the data.

The play-back software, "Data Analyzer", can start as below:


ECOTRONS Data Analyzer V3.1
File Edit Help
Open Plot Show Curser Hide All Signal Show Full Range
Variables Min/Max Value Description
Current_Timer

3.7.3.1 Data Analyzer

3.7.3.1 Open Data File

Go to "**File open**" or click "**open**" button, select the data file you want to analyze:

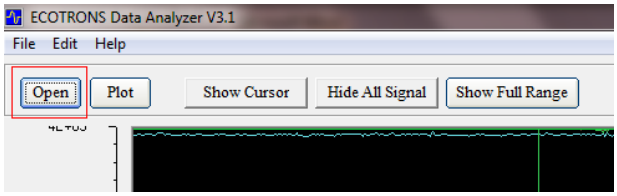


Figure 3.7.3.1.1

3.7.3.2 Show/Hide all signals

Click "**show all signal / hide all signal**", toggle the signal displays.

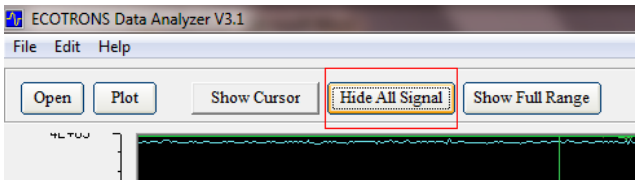


Figure 3.7.3.2.1

3.7.3.3 Show/Hide Cursors

Click "show cursor / hide cursor", toggle the cursors. There are 2 cursors in the scope window. The values of all signals at the 2 cursor locations will be displayed in the variable list window:

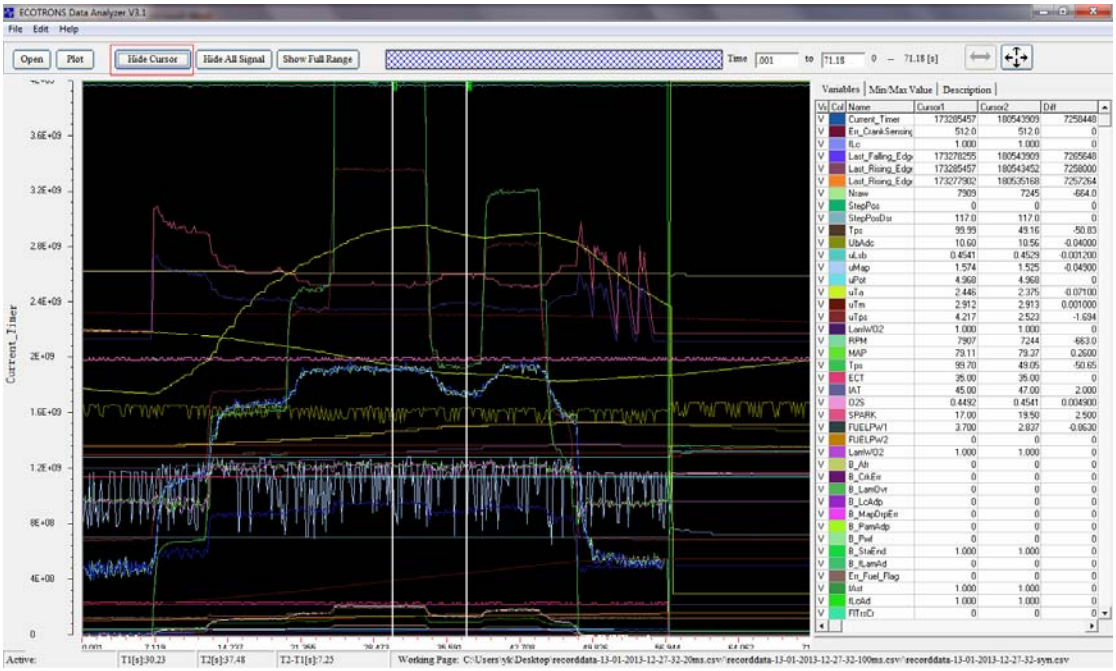


Figure 3.7.3.3.1

You can move either cursor by put your mouse on it and click and drag it to your desired location.

It will show the values of all the signals at the cursor locations.

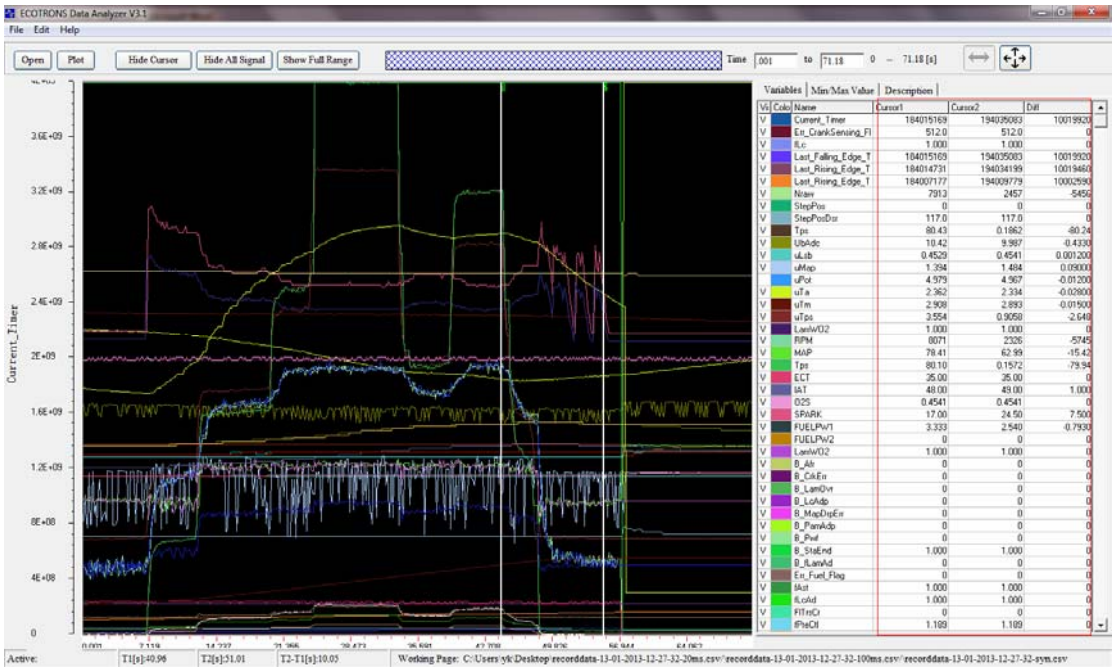


Figure 3.7.3.3.2

3.7.3.4 Line/Step curve type

Select curve type: Step / Line, to see the different curve shape.

"Line" means between 2 sample points the curve is connected by a straight line.

"Step" means between 2 sample points the curve is connected by a step change.

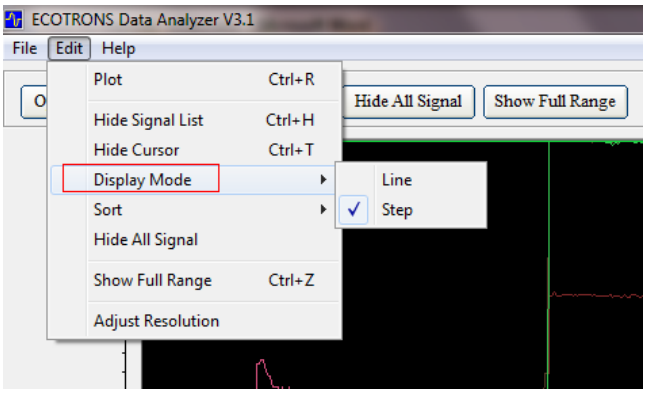


Figure 3.7.3.4.1

3.7.3.5 Zoom in/out X-axis

Input the "start time" value, and "end time" value, shown as below, to zoom in/zoom out the X-axis.

Click "show Full Range", to get the full time range of the data file.

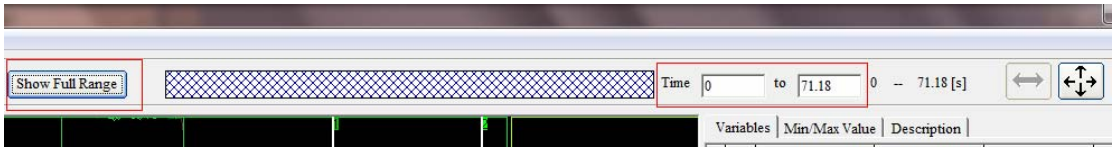
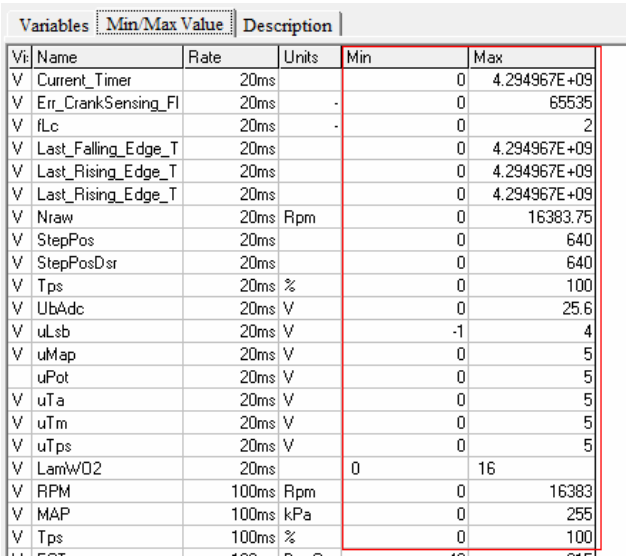


Figure 3.7.3.5.1

3.7.3.6 Zoom in/out Y-axis

Double click the "Max / Min" fields in the signal list, you can modify the max and min range of the signals, it will automatically zoom in/zoom out the Y-axis for the signals.



Vi	Name	Rate	Units	Min	Max
V	Current_Timer	20ms		0	4.294967E+09
V	Err_CrankSensing_Fl	20ms	-	0	65535
V	fLc	20ms	-	0	2
V	Last_Falling_Edge_T	20ms		0	4.294967E+09
V	Last_Rising_Edge_T	20ms		0	4.294967E+09
V	Last_Rising_Edge_T	20ms		0	4.294967E+09
V	Nraw	20ms	Rpm	0	16383.75
V	StepPos	20ms		0	640
V	StepPosDsr	20ms		0	640
V	Tps	20ms	%	0	100
V	UbAdc	20ms	V	0	25.6
V	uLsb	20ms	V	-1	4
V	uMap	20ms	V	0	5
	uPot	20ms	V	0	5
V	uTa	20ms	V	0	5
V	uTm	20ms	V	0	5
V	uTps	20ms	V	0	5
V	LamWO2	20ms		0	16
V	RPM	100ms	Rpm	0	16383
V	MAP	100ms	kPa	0	255
V	Tps	100ms	%	0	100

Figure 3.7.3.6.1

3.7.3.7 Save the Data Analyzer configuration

After you spend time to zoom in/out and/or select signals, you want to save these configurations. Just right click and choose "save configuration" and store it in a configuration file. Next time, you run Data Analyzer; you can open that configuration file and load all your previous settings.

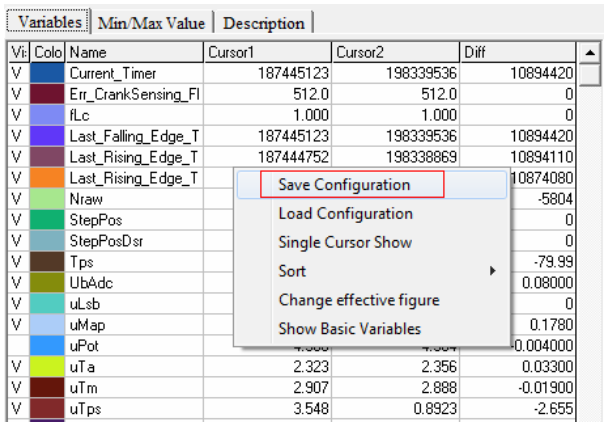


Figure 3.7.3.7.1

Chapter 4 Change Calibrations (Tuning)

ProCAL has a full set of features of professional engine calibration software. It supports "on-the-fly" calibration, and makes the tuning easier and fun for the users. It has hundreds of calibration parameters for user to tune.

To make it easier to start, or for beginners, the intuitive calibration menu is added to ProCAL. The user can go to menu, follow the subsystems, and pick the specific engine control parameters to tune.

The advanced user can go to "Advanced -> advanced calibrations" and pick any parameters to tune.

To better understand the physical meaning of the calibration parameters, it is strongly recommended to browse through our calibration guide, which is a HTML format graphical control strategy flow-chart. Contact us for an electronic copy.

4.1 Change system parameters

The first thing the user wants to confirm is the basic engine parameters are defined correctly. For example the displacement and RPM range:

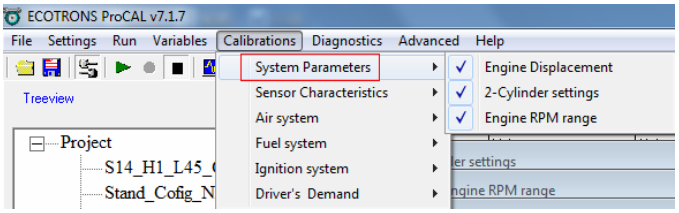


Figure 4.1.1

4.2 Tune calibration VALUE, CURVE, or MAP

Calibrations are 3 types: Values, Curves and Maps. The labels start with the prefix so you can tell immediately. VAL_ means it's a calibration value. CUR_ means it is a curve with one input. MAP_ means it is a map with 2 inputs.

Example 1: Modify the min/max RPM range:

- Double click the cell that you want to modify.

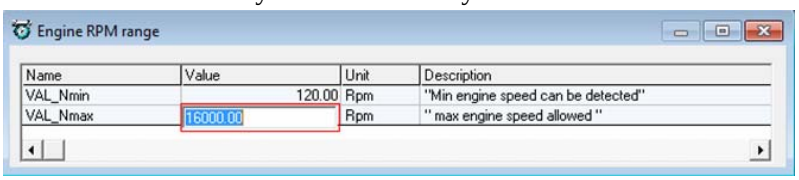


Figure 4.2.1

- Input the value you want

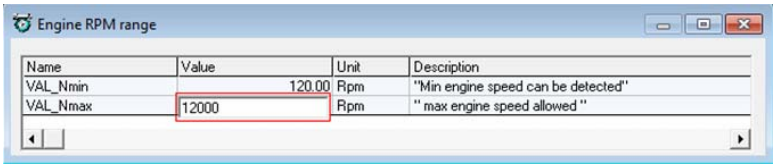


Figure 4.2.2

- Press "Enter" key. The modified data will show as **"red"**. This method applies to break points, too.

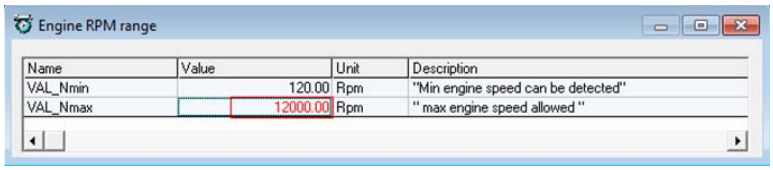


Figure 4.2.3

Example 2: Modify the calibration **map** data:

- Double click the cell that you want to modify.

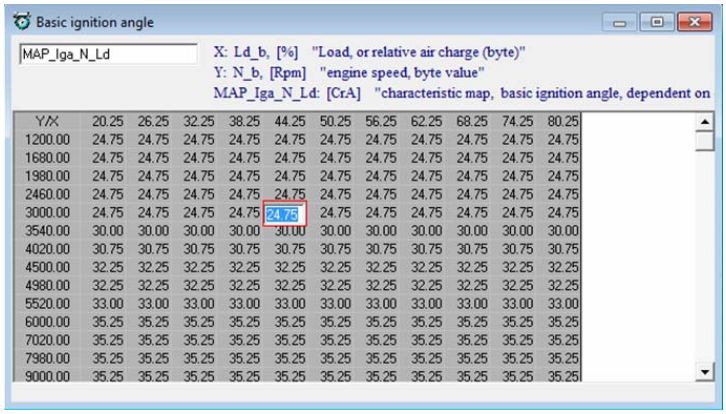


Figure 4.2.4

- Input the value you want

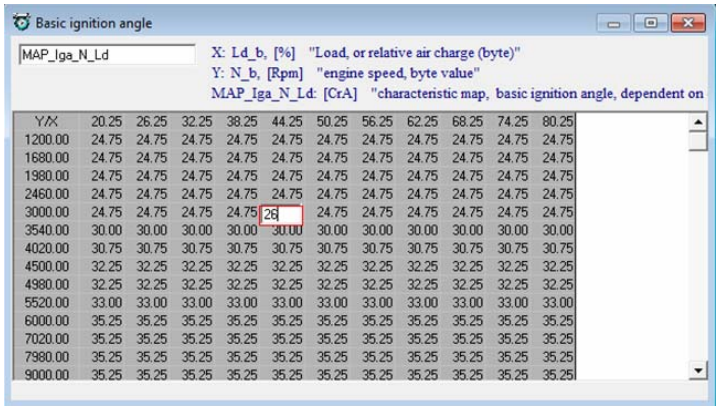
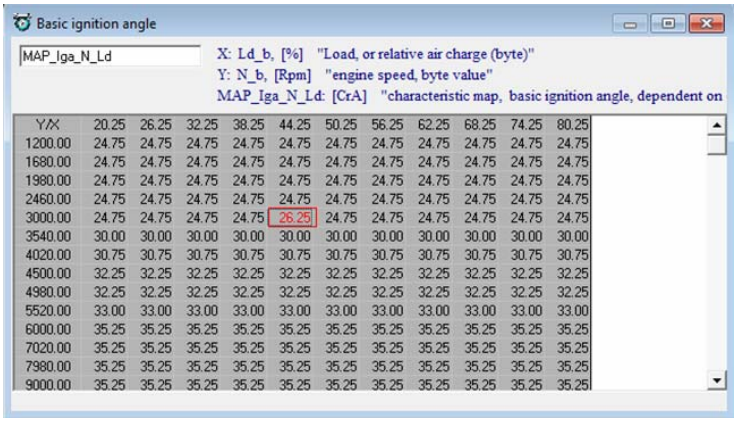


Figure 4.2.5

- Press "Enter" key. The modified data will show as **"red"**. This method applies to break points, too.


Basic ignition angle
MAP_Iga_N_Ld
X: Ld_b, [%] "Load, or relative air charge (byte)"
Y: N_b, [Rpm] "engine speed, byte value"
MAP_Iga_N_Ld: [CrA] "characteristic map, basic ignition angle, dependent on

Y/X	20.25	26.25	32.25	38.25	44.25	50.25	56.25	62.25	68.25	74.25	80.25
1200.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
1680.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
1980.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
2460.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
3000.00	24.75	24.75	24.75	24.75	26.25	24.75	24.75	24.75	24.75	24.75	24.75
3540.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
4020.00	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75
4500.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
4980.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
5520.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
6000.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
7020.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
7980.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
9000.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25

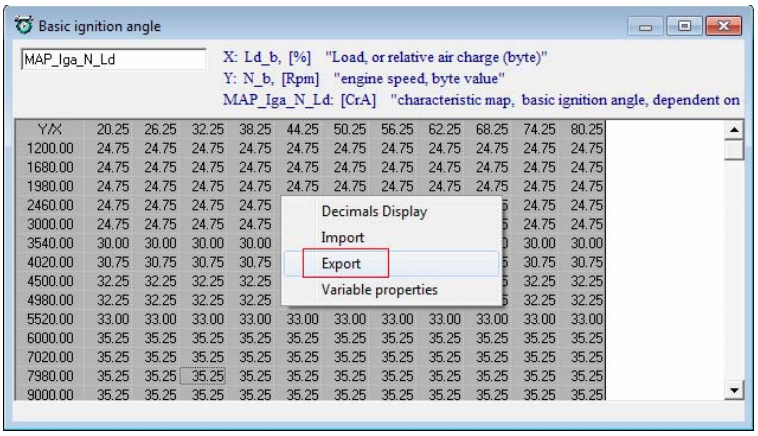
Figure 4.2.6

4.3 Export / Import Calibration Data

You can also do data export to Excel sheet, and modified the data in Excel. After the modification, you can import data back to ProCAL. This is most useful for Curve and Map tables.

Example 2: Export / Import Calibration Data

- Right-Click the parameter window, select the **Export** option.



Y/X	20.25	26.25	32.25	38.25	44.25	50.25	56.25	62.25	68.25	74.25	80.25
1200.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
1680.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
1980.00	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
2460.00	24.75	24.75	24.75	24.75						24.75	24.75
3000.00	24.75	24.75	24.75	24.75						24.75	24.75
3540.00	30.00	30.00	30.00	30.00						30.00	30.00
4020.00	30.75	30.75	30.75	30.75						30.75	30.75
4500.00	32.25	32.25	32.25	32.25						32.25	32.25
4980.00	32.25	32.25	32.25	32.25						32.25	32.25
5520.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
6000.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
7020.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
7980.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
9000.00	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25

Figure 4.3.1

- The program will pop-up a "save as" dialog window.

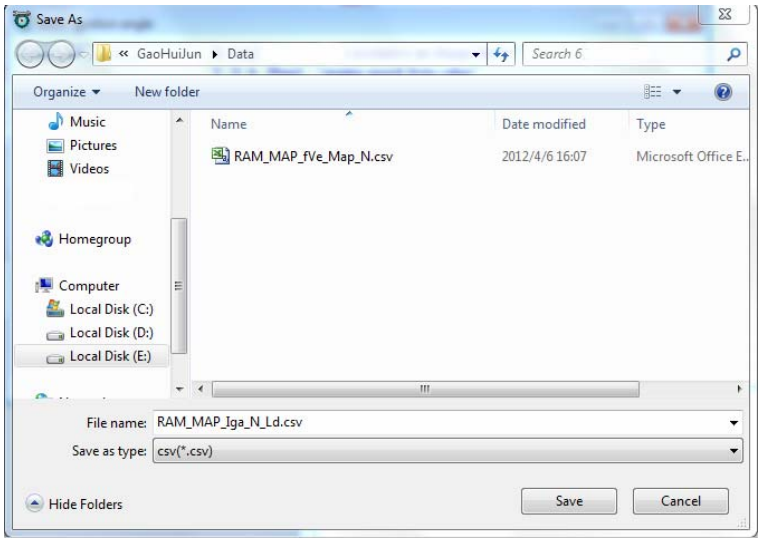


Figure 4.3.2

- If you click **save**, the program will save a **CSV** file and open it in Excel. The default name of the CSV file is the calibration label name.

A1 MAP_Iga_N_Ld: [CrA] "characteristic map; basic ignition angle; dependent on engine

	A	B	C	D	E	F	G	H	I	J	K	L
1	MAP_Iga_N_Ld: [CrA] "characteristic map; basic ignition angle; dependent on engine speed and load"											
2	X: Ld_b; [%] "Load; or relative air charge (byte)"											
3	Y: N_b; [Rpm] "engine speed; byte value"											
4	Y/X	20.25	26.25	32.25	38.25	44.25	50.25	56.25	62.25	68.25	74.25	80.25
5	1200	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
6	1680	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
7	1980	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
8	2460	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
9	3000	24.75	24.75	24.75	24.75	26.25	24.75	24.75	24.75	24.75	24.75	24.75
10	3540	30	30	30	30	30	30	30	30	30	30	30
11	4020	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75
12	4500	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
13	4980	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
14	5520	33	33	33	33	33	33	33	33	33	33	33
15	6000	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
16	7020	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
17	7980	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
18	9000	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
19	10020	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
20	10200	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25

Figure 4.3.3

- It is recommend to modify your curve and map tables in Excel, and smoothen them in Excel and then imported back to ProCAL.

F7 27

	A	B	C	D	E	F	G	H	I	J	K	L
1	MAP_Iga_N_Ld: [CrA] "characteristic map; basic ignition angle; dependent on engine speed and load"											
2	X: Ld_b; [%] "Load; or relative air charge (byte)"											
3	Y: N_b; [Rpm] "engine speed; byte value"											
4	Y/X	20.25	26.25	32.25	38.25	44.25	50.25	56.25	62.25	68.25	74.25	80.25
5	1200	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
6	1680	24.75	24.75	24.75	26	24.75	24.75	24.75	24.75	24.75	24.75	24.75
7	1980	24.75	24.75	24.75	24.75	27	24.75	24.75	24.75	24.75	24.75	24.75
8	2460	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
9	3000	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75	24.75
10	3540	30	30	30	30	30	30	30	30	30	30	30
11	4020	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75
12	4500	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
13	4980	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
14	5520	33	33	33	33	33	33	33	33	33	33	33
15	6000	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
16	7020	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
17	7980	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
18	9000	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
19	10020	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25
20	10200	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25

Figure 4.3.4 Modify Data

- If you want to import you just edited calibration tables, Right-Click the parameter window, select the **Import** option.

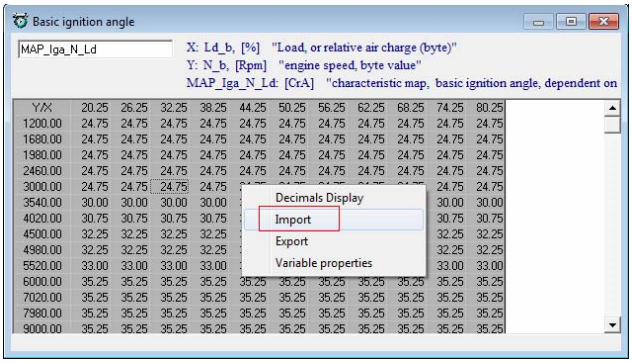


Figure 4.3.5

- Import the **CSV** file you just modified.

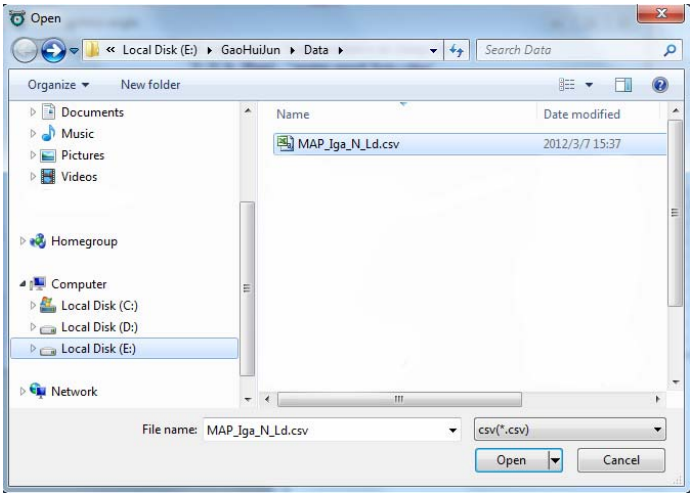


Figure 4.3.6

- The modified data will show as "**red**".

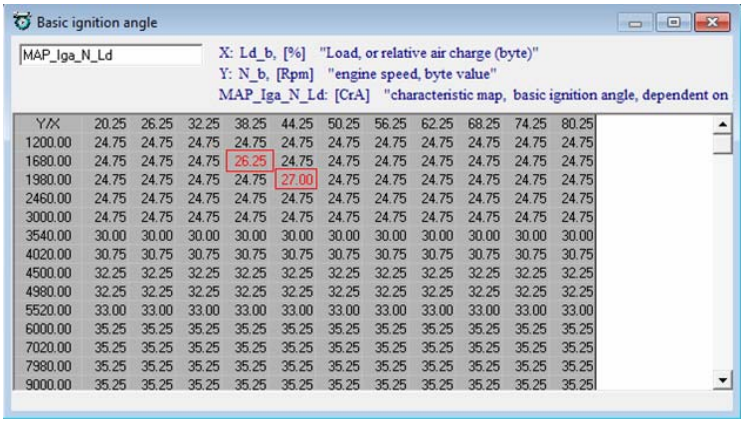

Basic ignition angle
MAP_Iga_N_Ld
X: Ld_b, [%] "Load, or relative air charge (byte)"
Y: N_b, [Rpm] "engine speed, byte value"
MAP_Iga_N_Ld: [CrA] "characteristic map, basic ignition angle, dependent on

Figure 4.3.7

4.4 Save the calibrations

After changing the calibrations, you can save the data set to a different CAL file name. It will show up in the left window of the project tree structure.

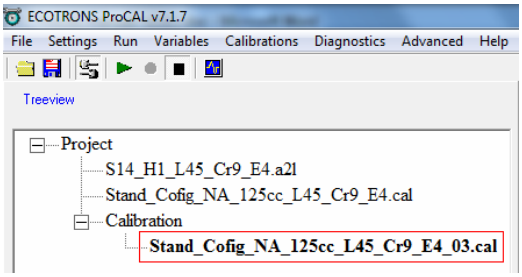


Figure 4.4.1

The next time ProCAL start, it will automatically load user's last saved **CAL** file. In the lower left corner of the ProCAL you will find some hints.

4.5 Activate the new Calibrations

Under the same project tree structure, with the same A2L file (matching the software in the ECU); you can have multiple calibrations, or CAL files.

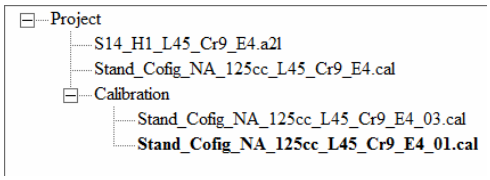


Figure 4.5.1

By highlight the certain .CAL file, and right click, select "Activate", you will activate that calibration. And it will automatically compare it against to the calibrations in the ECU.

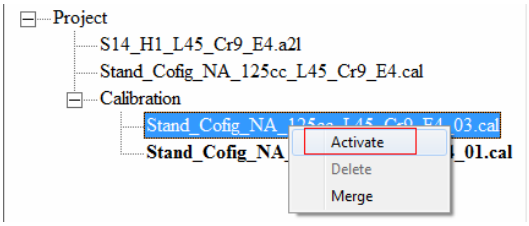


Figure 4.5.2

4.6 Burn to ECU or Fetch form ECU

Whenever click the **Connect** button, ProCAL will automatically compare the CAL file against the one loaded into ECU already. It will pop-up a **Message** dialog box if the ECU's CAL file and the ProCAL CAL file do not match.

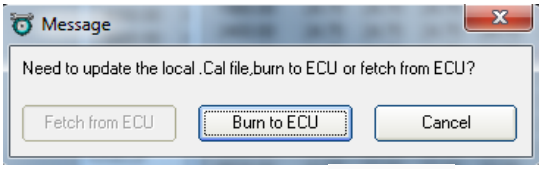


Figure 4.6.1 Message dialog box

You can choose **Fetch from ECU** or **Burn to ECU**. If you want to update the data in ECU, please click on the **Burn to ECU** button, the software will pop up a progress bar (Figure 4.6.2), when it is finished, ECU will be reset.

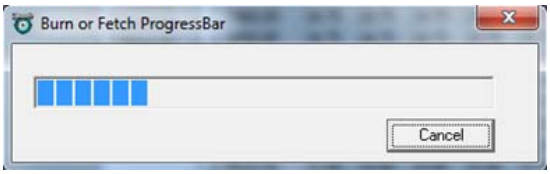


Figure 4.6.2

You can also use ProCAL menu bar to Fetch form ECU or Burn to ECU by click **Run→Fetch form ECU** or **Burn to ECU**.(If the menu is disabled, maybe you did not connect to the ECU or the data measuring is in progress).

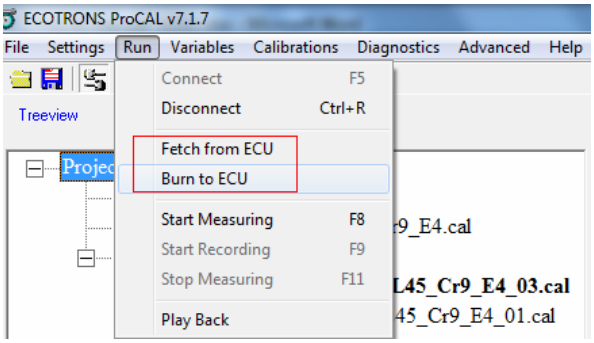


Figure 4.3.3 Burn to ECU

4.7 Decimal display

You can change the number of decimals of the values that are displayed in the variable window and calibration window.

- For example, right click the below MAP calibration window and select "**Decimals Display**".

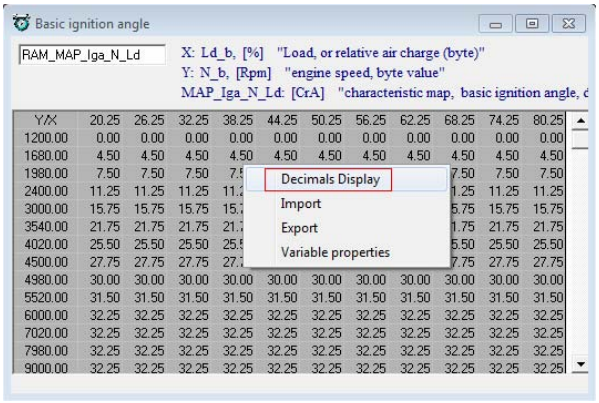


Figure 4.7.1

- A data display settings window pops up:

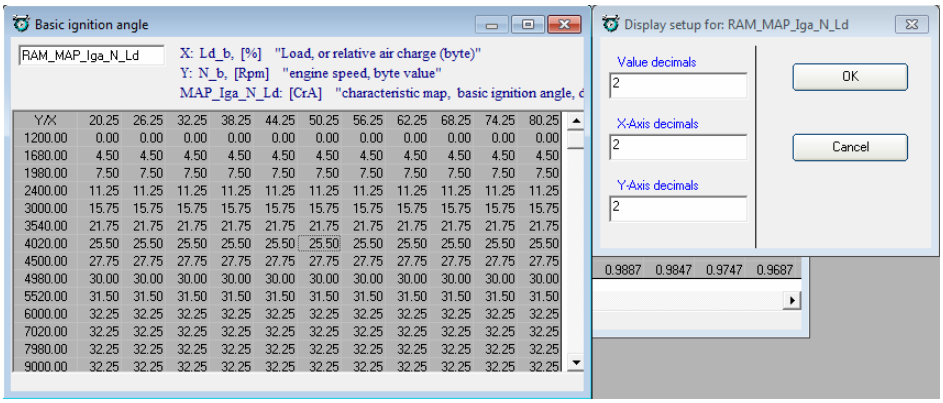


Figure 4.7.2

- The user can change the data decimals, click **OK.**

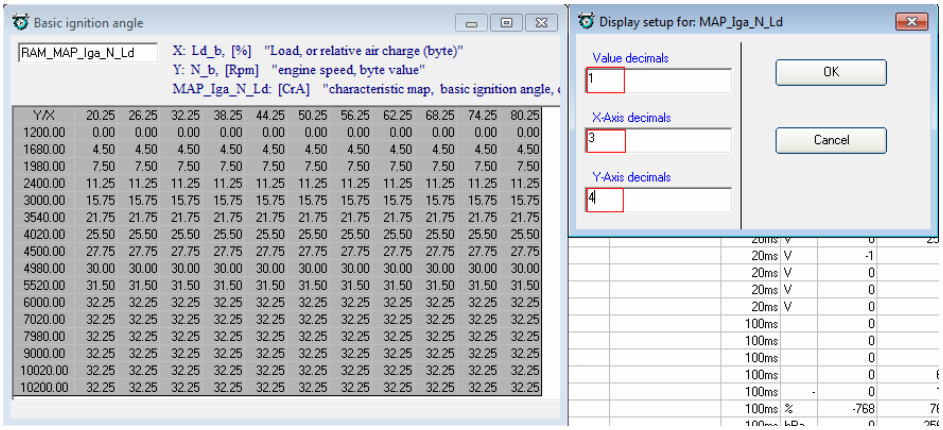
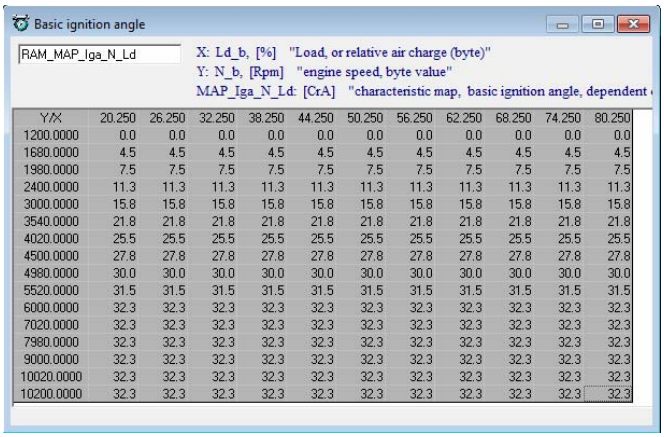


Figure 4.7.3


Basic ignition angle
RAM_MAP_Iga_N_Ld
X: Ld_b, [%] "Load, or relative air charge (byte)"
Y: N_b, [Rpm] "engine speed, byte value"
MAP_Iga_N_Ld: [CrA] "characteristic map, basic ignition angle, dependent

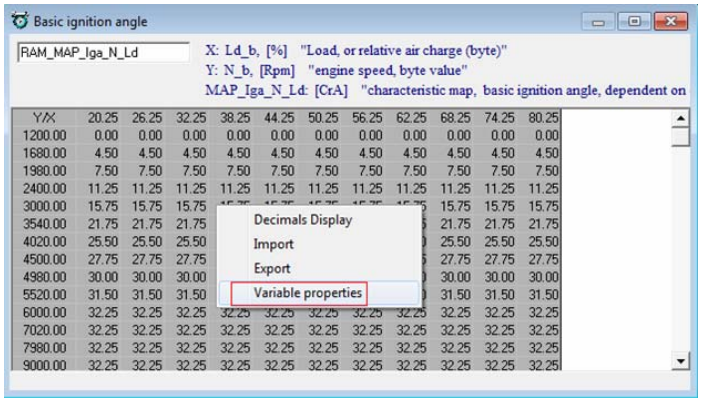
Y/X	20.250	26.250	32.250	38.250	44.250	50.250	56.250	62.250	68.250	74.250	80.250
1200.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1680.0000	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
1980.0000	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
2400.0000	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
3000.0000	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
3540.0000	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
4020.0000	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5
4500.0000	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
4980.0000	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
5520.0000	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
6000.0000	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3
7020.0000	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3
7980.0000	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3
9000.0000	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3
10020.0000	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3
10200.0000	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3

Figure 4.7.4 after the modification

4.8 Signal/Parameter properties

The detailed properties of the variables (signals and parameters), can be viewed in the variable property window.

Right click the variable and select the **Variable properties**, can open the **Variable properties** window. (This may require advanced user permissions)



Y/X	20.25	26.25	32.25	38.25	44.25	50.25	56.25	62.25	68.25	74.25	80.25
1200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1680.00	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
1980.00	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
2400.00	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
3000.00	15.75	15.75	15.75						15.75	15.75	15.75
3540.00	21.75	21.75	21.75						21.75	21.75	21.75
4020.00	25.50	25.50	25.50						25.50	25.50	25.50
4500.00	27.75	27.75	27.75						27.75	27.75	27.75
4980.00	30.00	30.00	30.00						30.00	30.00	30.00
5520.00	31.50	31.50	31.50						31.50	31.50	31.50
6000.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
7020.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
7980.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25
9000.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25	32.25

Figure 4.8.1

In the **variable properties** window it will display detailed properties of the variable. (Signal and Parameters)

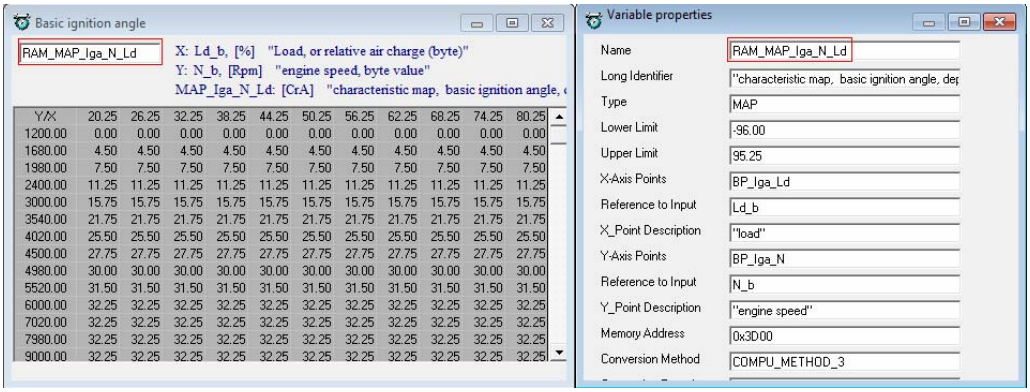

Basic ignition angle
RAM_MAP_Iga_N_Ld
X: Ld_b, [%] "Load, or relative air charge (byte)"
Y: N_b, [Rpm] "engine speed, byte value"
MAP_Iga_N_Ld: [CrA] "characteristic map, basic ignition angle,
Y/X 20.25 26.25 32.25 38.25 44.25 50.25 56.25 62.25 68.25 74.25 80.25
1200.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
1680.00 4.50 4.50 4.50 4.50 4.50 4.50 4.50 4.50 4.50 4.50 4.50
1980.00 7.50 7.50 7.50 7.50 7.50 7.50 7.50 7.50 7.50 7.50 7.50
2400.00 11.25 11.25 11.25 11.25 11.25 11.25 11.25 11.25 11.25 11.25 11.25
3000.00 15.75 15.75 15.75 15.75 15.75 15.75 15.75 15.75 15.75 15.75 15.75
3540.00 21.75 21.75 21.75 21.75 21.75 21.75 21.75 21.75 21.75 21.75 21.75
4020.00 25.50 25.50 25.50 25.50 25.50 25.50 25.50 25.50 25.50 25.50 25.50
4500.00 27.75 27.75 27.75 27.75 27.75 27.75 27.75 27.75 27.75 27.75 27.75
4980.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00
5520.00 31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50
6000.00 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25
7020.00 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25
7980.00 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25
9000.00 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25 32.25
Variable properties
Name RAM_MAP_Iga_N_Ld
Long Identifier "characteristic map, basic ignition angle, dep
Type MAP
Lower Limit -96.00
Upper Limit 95.25
X-Axis Points BP_Iga_Ld
Reference to Input Ld_b
X_Point Description "load"
Y-Axis Points BP_Iga_N
Reference to Input N_b
Y_Point Description "engine speed"
Memory Address 0x3D00
Conversion Method COMPU_METHOD_3

Figure 4.8.2

Chapter 5 Diagnosis

Fault diagnosis function helps users to quickly find problems. You can run Diagnosis when the system does not work properly.

5.1 Get the DTC of ECU

Click "**Diagnostics**" and select the "**Run Diagnostics**", open the Diagnostic window.

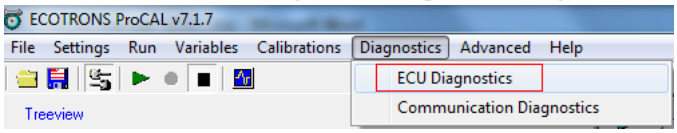


Figure 5.1.1

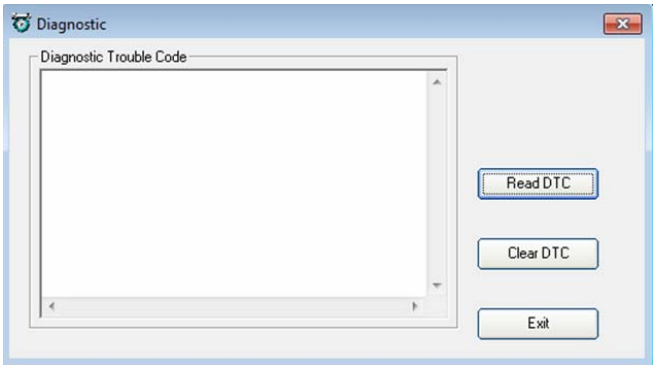


Figure 5.1.2

Click the **Read DTC** can get trouble code, when the system does not work properly.

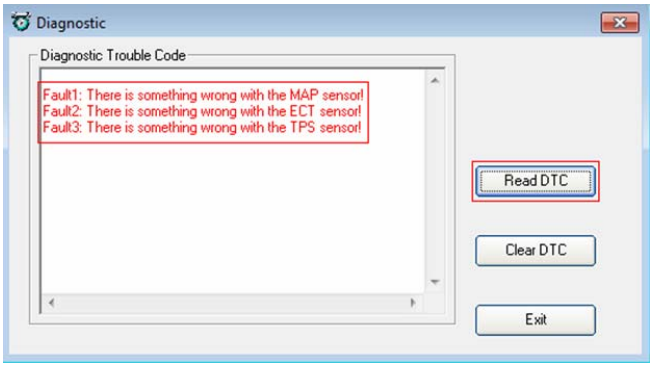

Diagnostic
Diagnostic Trouble Code
Fault1: There is something wrong with the MAP sensor!
Fault2: There is something wrong with the ECT sensor!
Fault3: There is something wrong with the TPS sensor!
Read DTC
Clear DTC
Exit

Figure 5.1.3

You can click **Clear DTC,** remove Trouble Code.

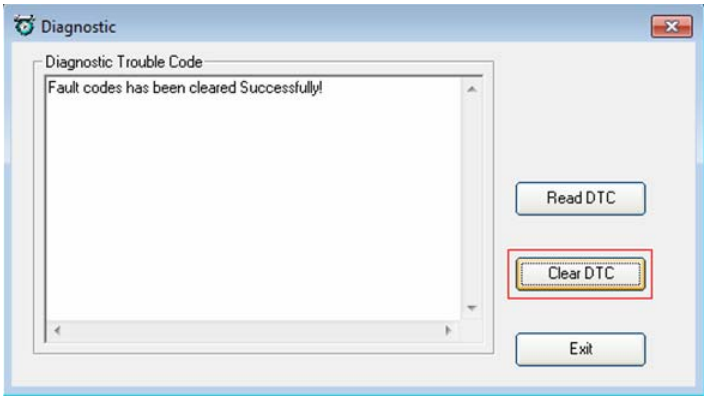


Figure 5.1.4

5.2 Failed to connect to the ECU

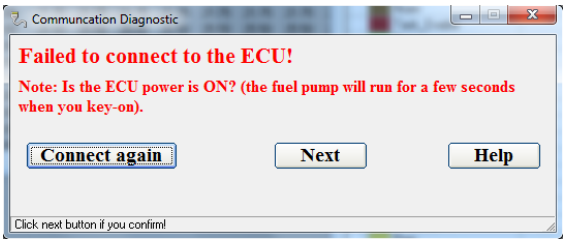

Communcation Diagnostic
Failed to connect to the ECU!
Note: Is the ECU power is ON? (the fuel pump will run for a few seconds when you key-on).
Connect again
Next
Help
Click next button if you confirm!

Figure 5.2.1 Failed to connect to the ECU

Please check:

1. Is the ECU power is ON? (The fuel pump will run for a few seconds when you key-on).
2. Do you have the latest and greatest ProCAL version?
3. If you are running ProCAL in Win 7, have you set ProCAL in "Win XP compatibility" mode? (Refer to the manual on how to do that).
4. Are you connecting the computer to the ECU via a built-in COM port or USB adaptor?
5. If you use a built-in COM port of the computer, please go to "**setting communication settings**" and select COM port.
6. If you use an USB adaptor, is it made by ECOTRONS? If yes, you need to go to "**setting communication settings**" and select USB.
7. If you use an USB adaptor from a third party, you need to select COM port and manually set the COM port number. Follow the below procedures on how to.

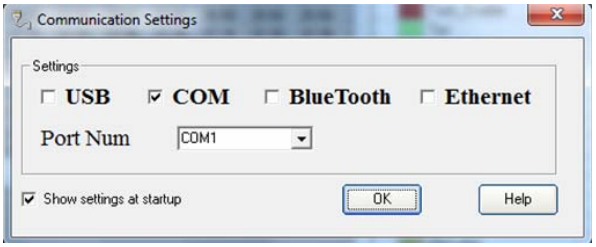

Communication Settings
Settings
USB
COM
BlueTooth
Ethernet
Port Num
COM1
Show settings at startup
OK
Help

Figure 5.2.2

How to manually set the COM port:

1) Find out the virtual COM port # from USB to RS232 converter, by going to "My Computer", right click and select "Properties".

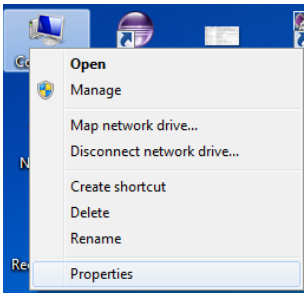


Figure 5.2.3

2) Then click "Device Manager" tab.

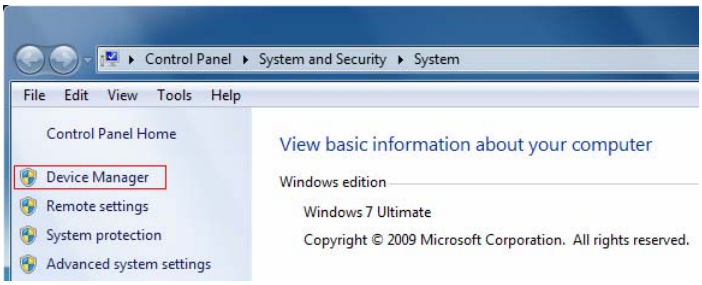

Control Panel ▸ System and Security ▸ System
File Edit View Tools Help
Control Panel Home
Device Manager
Remote settings
System protection
Advanced system settings
View basic information about your computer
Windows edition
Windows 7 Ultimate
Copyright © 2009 Microsoft Corporation. All rights reserved.

Figure 5.2.4

3) You will get the below window:

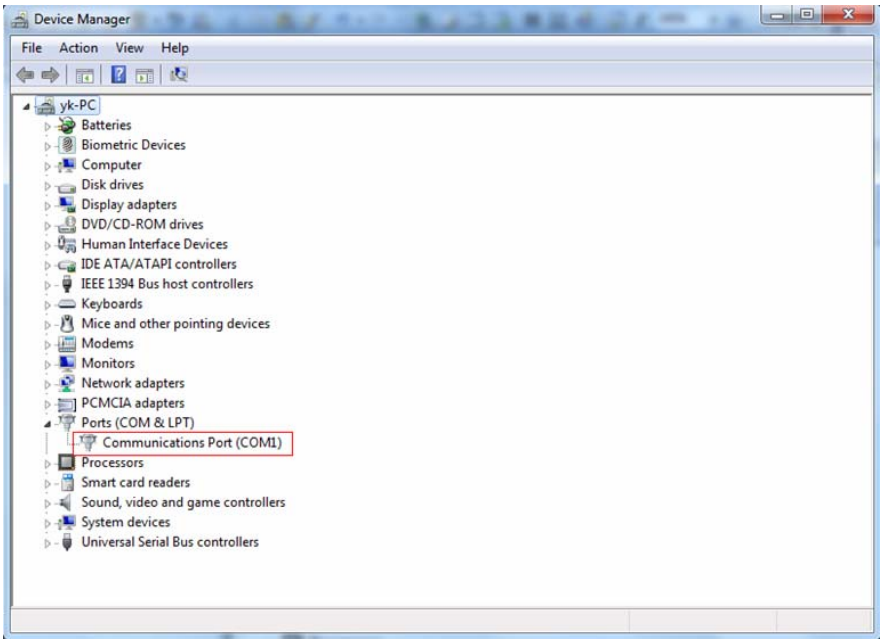


Figure 5.2.5

4) Find the virtual COM port #, and write it down. Then start the ProCAL:

5) Go to "**menu setting communication settings**"; You will get the below window, select the COM port # you wrote down. And "**OK**".

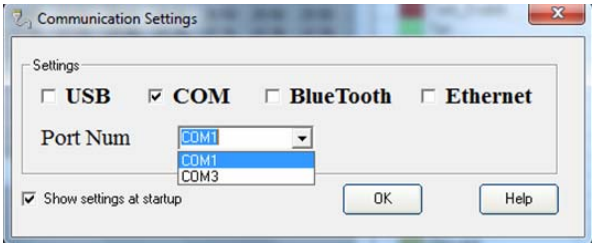


Figure 5.2.6

Chapter 6 Uninstall the ProCAL

If you want uninstall the ProCAL, please click the **Start All Programs ProCAL Uninstall ProCAL**.

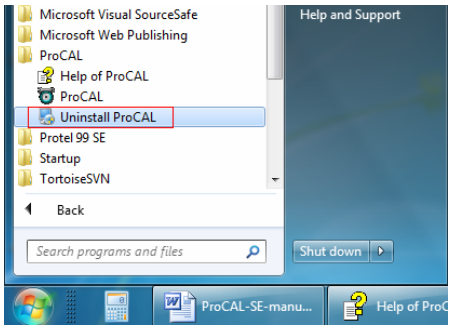


Figure 6.1 Uninstall ProCAL

Chapter 7 Frequently Asked Questions

7.1 How to compare and copy a file

1) Open the software "Compare V1.7": go to "Advanced→Calibration Data Manager"

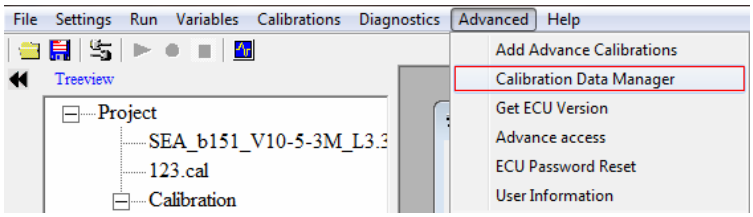


Figure7.1.1

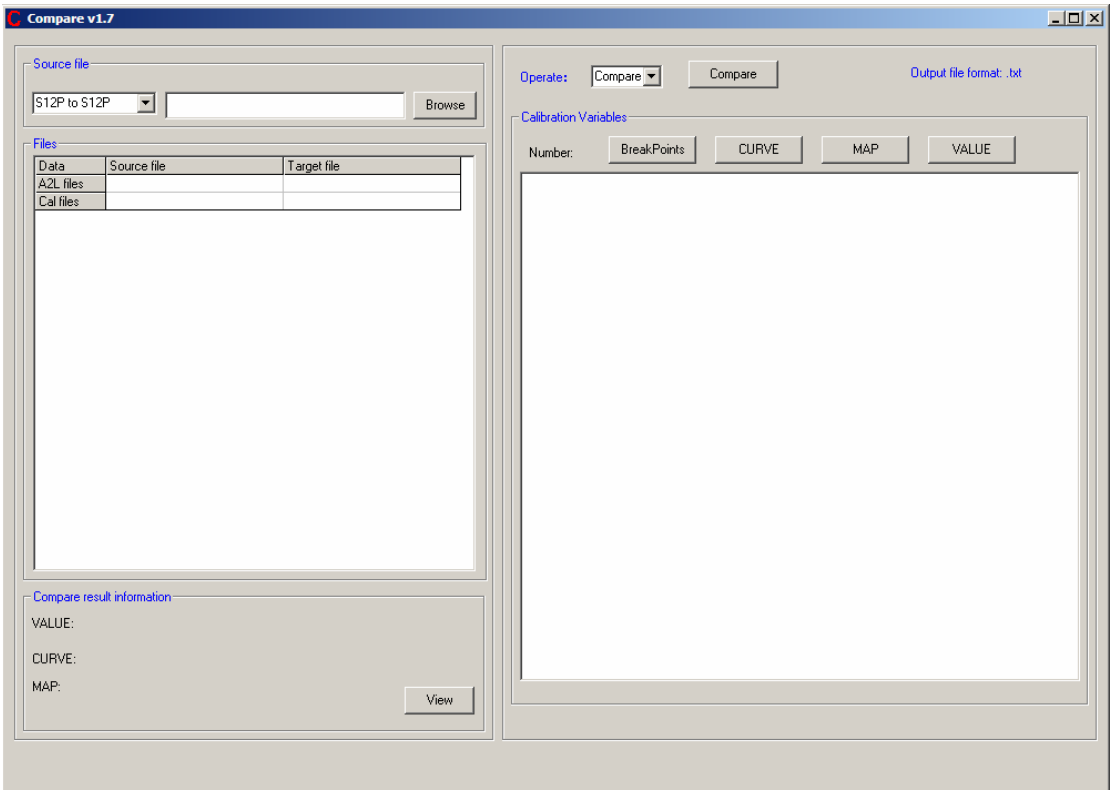


Figure7.1.2

2) Open the data file, to click "Browse" for opening file.

First, open the Source file (the file that you want to remain the some calibrated value by yourself)

Second, open the Target file (the file that replaced the some old variables value except your own calibrated value)

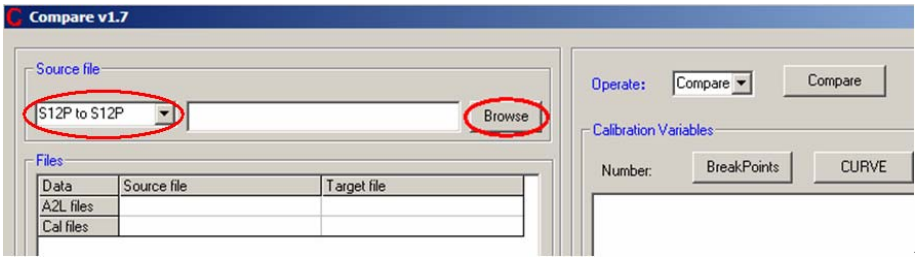


Figure7.1.3

(1) Select "S12P to S12P". Open the "Source file "(A2L & CAL).

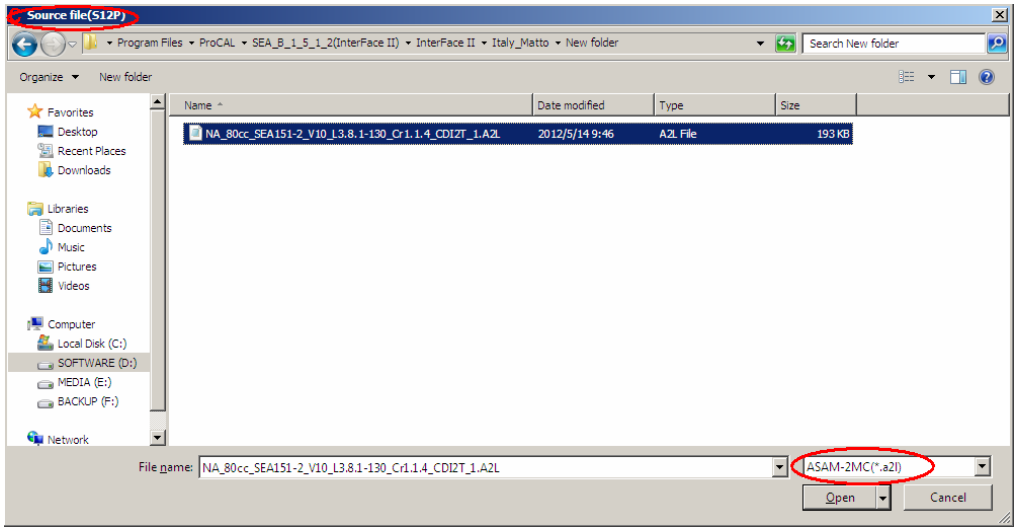


Figure7.1.4

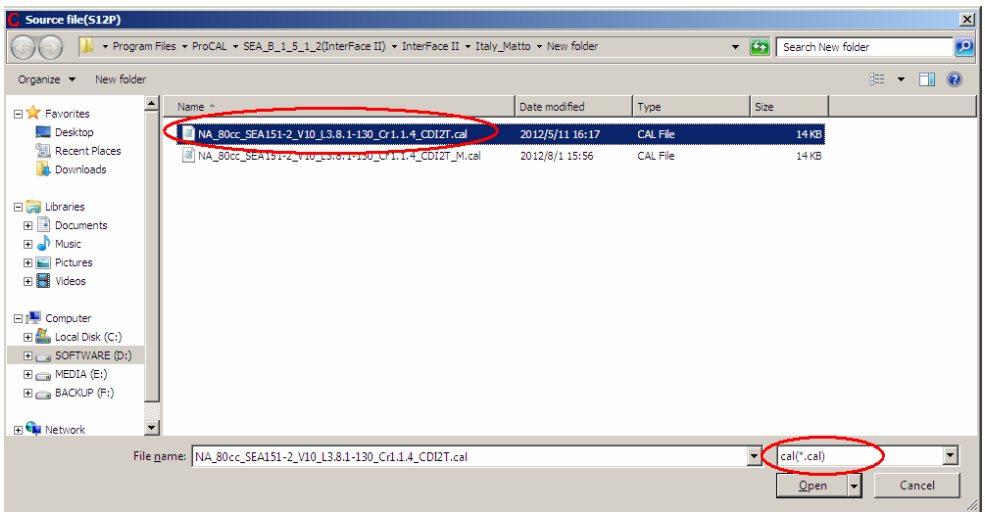


Figure7.1.5

(2) Open the "Target file" (A2L & CAL).

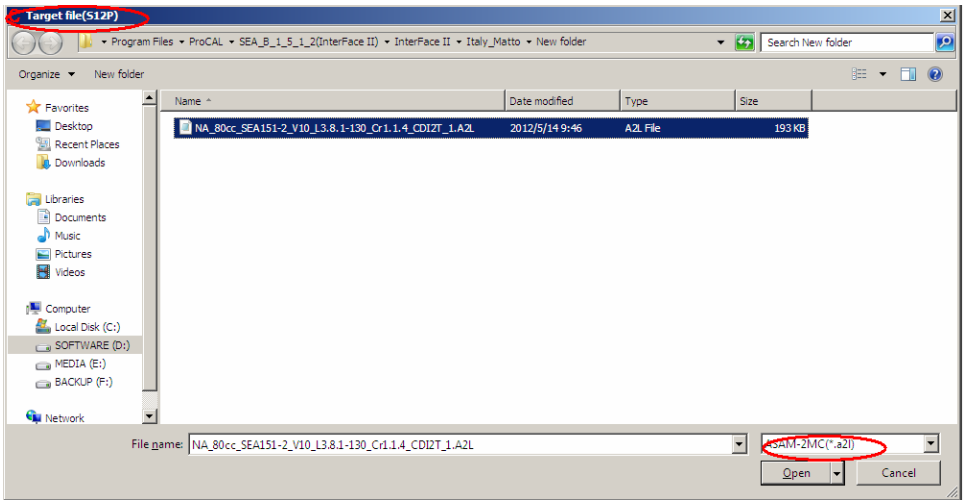


Figure 7.1.6

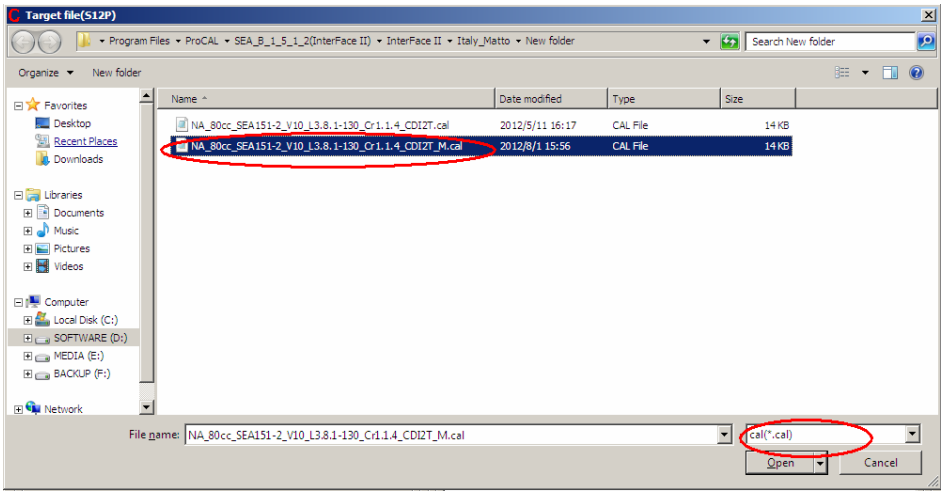


Figure 7.1.7

Wait for about ten seconds.

Note: If the file loaded successfully, lower left corner will pop up message "Load Successfully"

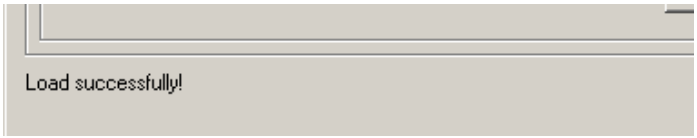


Figure 7.1.8

3) Copy the date file.

First, choose "Copy"

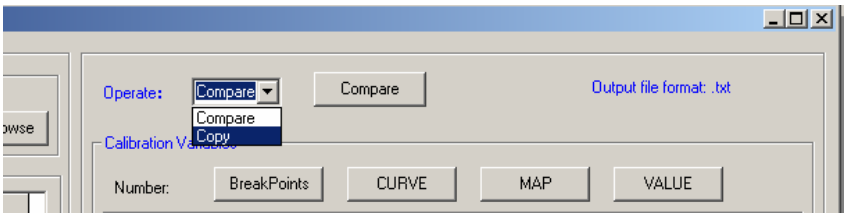


Figure 7.1.9

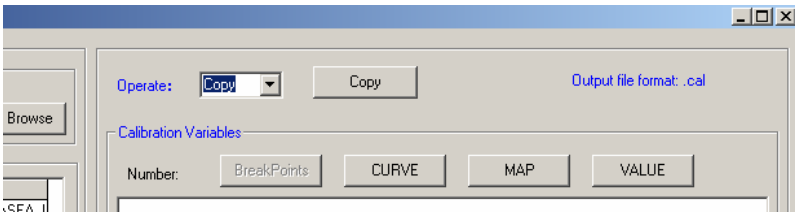


Figure 7.1.10

Then, click the" Copy "button, it will copy the file

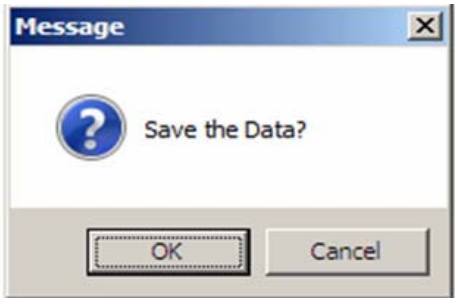


Figure 7.1.11

Click "OK" button and save the result (a new cal file).

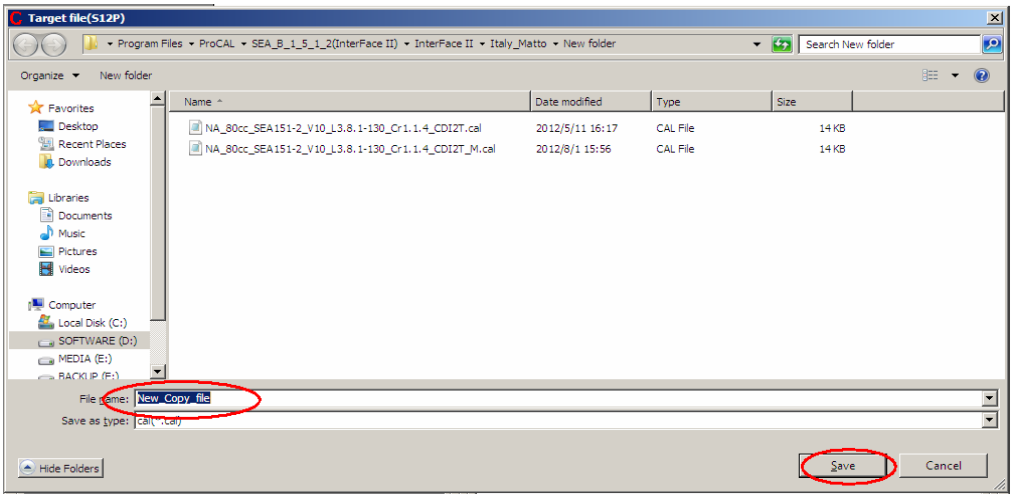


Figure 7.1.12

4) If you want to know whether the copy file is successfully you can compare the source file and the new saved file.

Using the above mentioned method to open the "Source file" that your own file and the "Target file" that the new saved file.

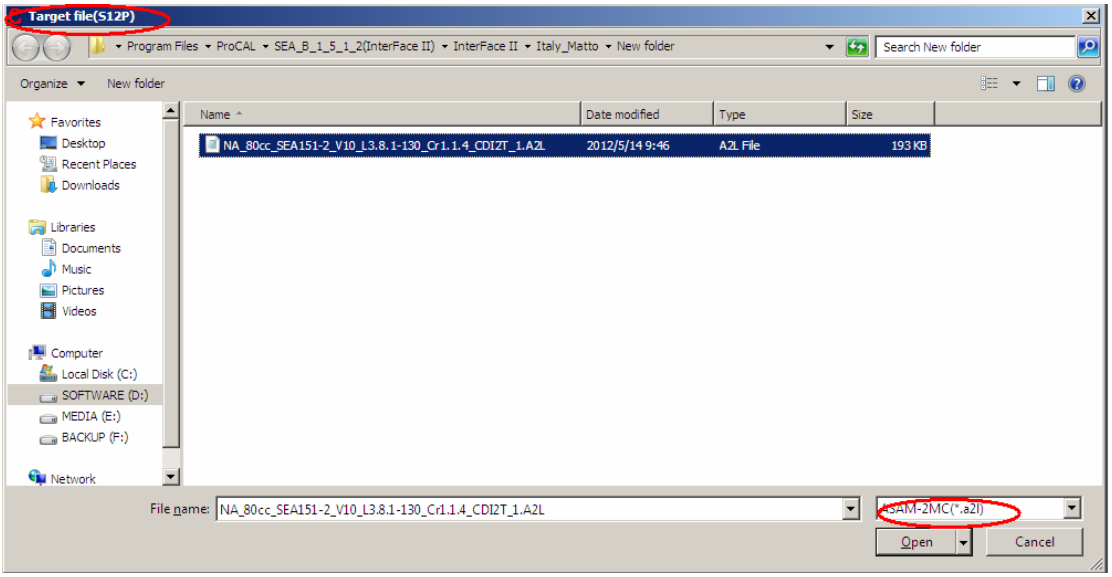


Figure 7.1.11

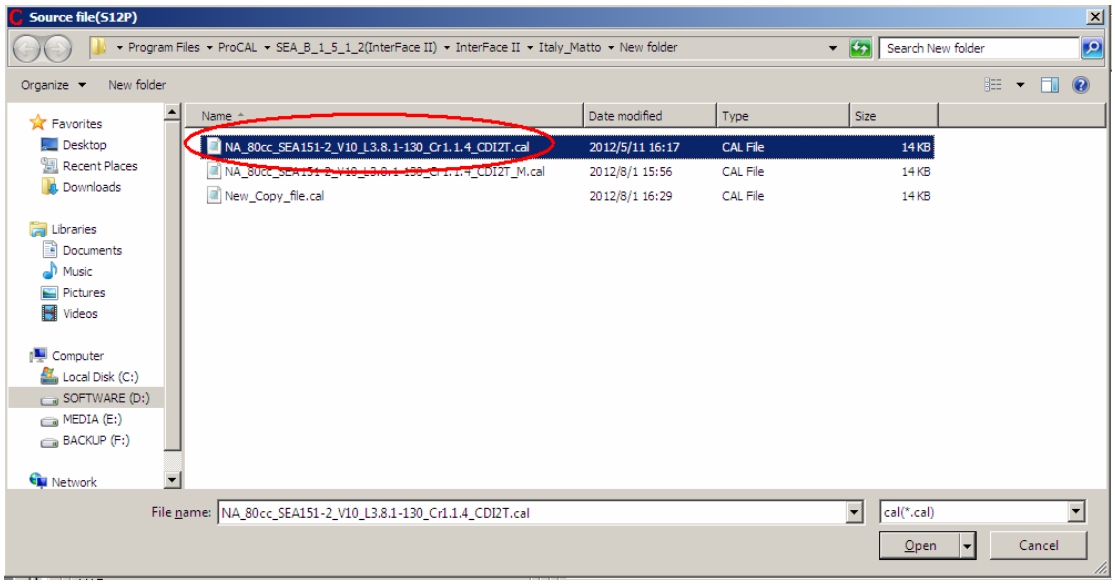


Figure 7.1.12

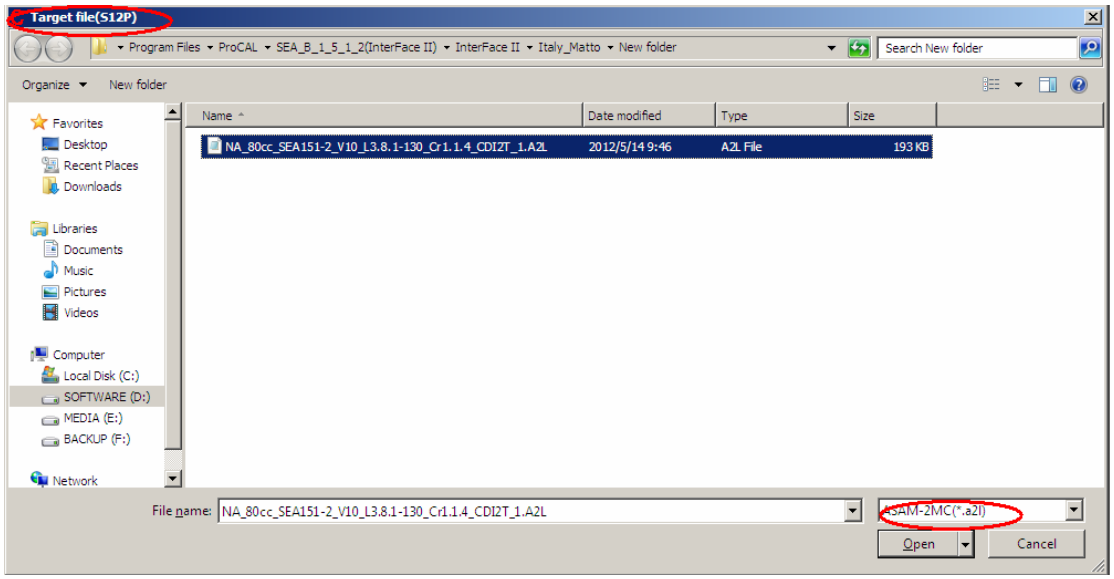


Figure 7.1.13

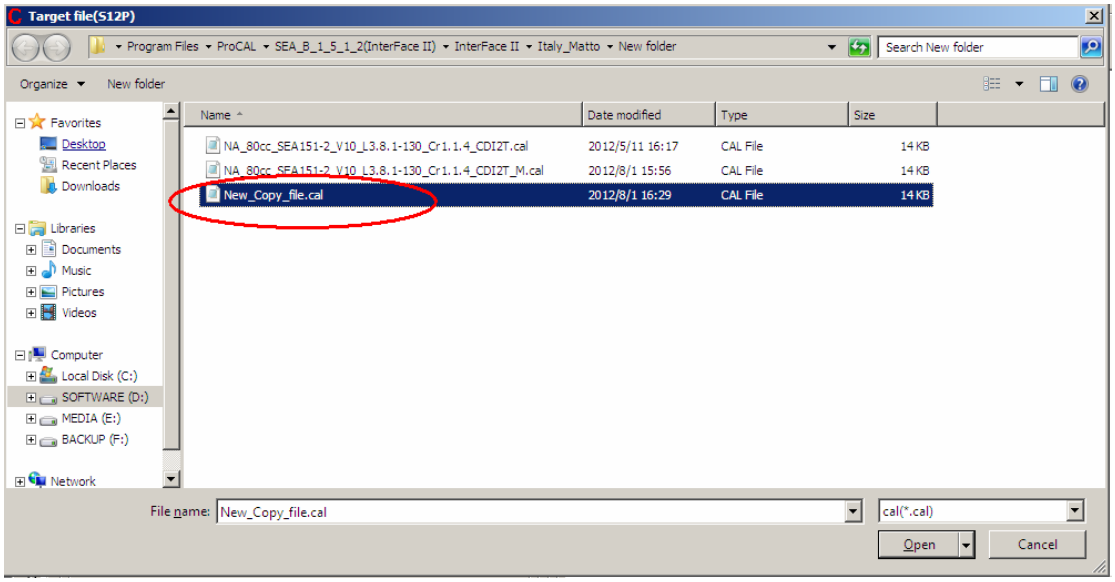


Figure 7.1.14

To choose "Compare"

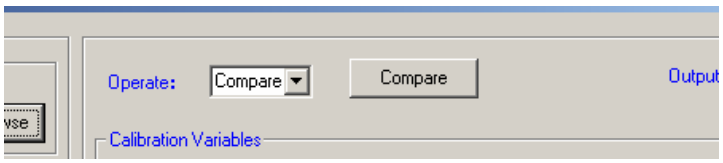


Figure 7.1.15

To click "Compare", button and save the compare result.

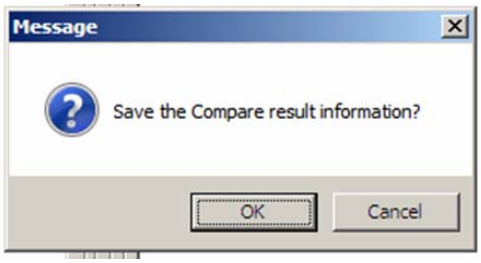


Figure 7.1.16

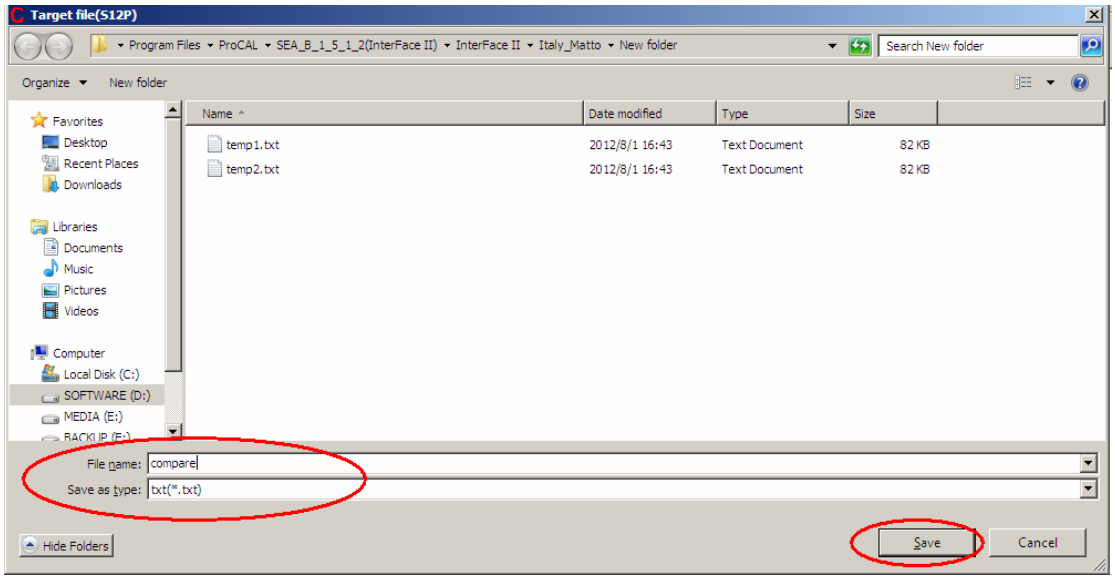


Figure 7.1.17

You can see the result through follow method.

(1)

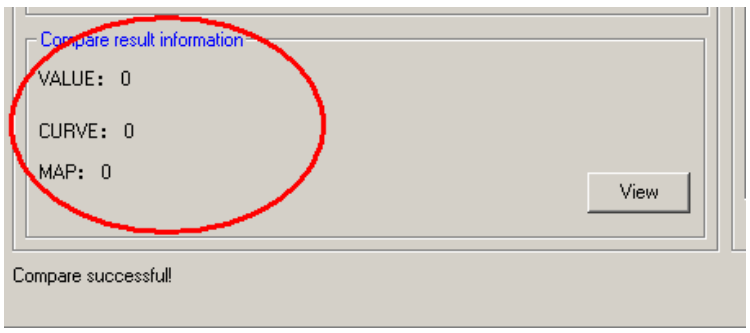


Figure 7.1.18

(2)Click" View" button to open the .txt file that just saved

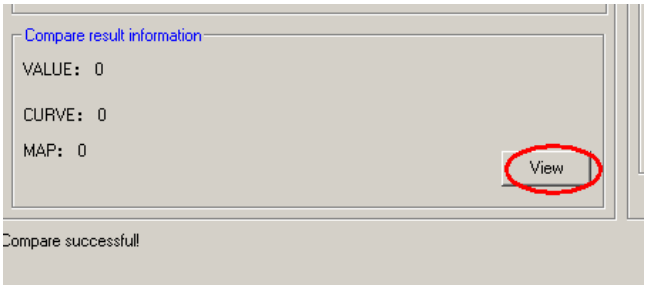


Figure 7.1.19

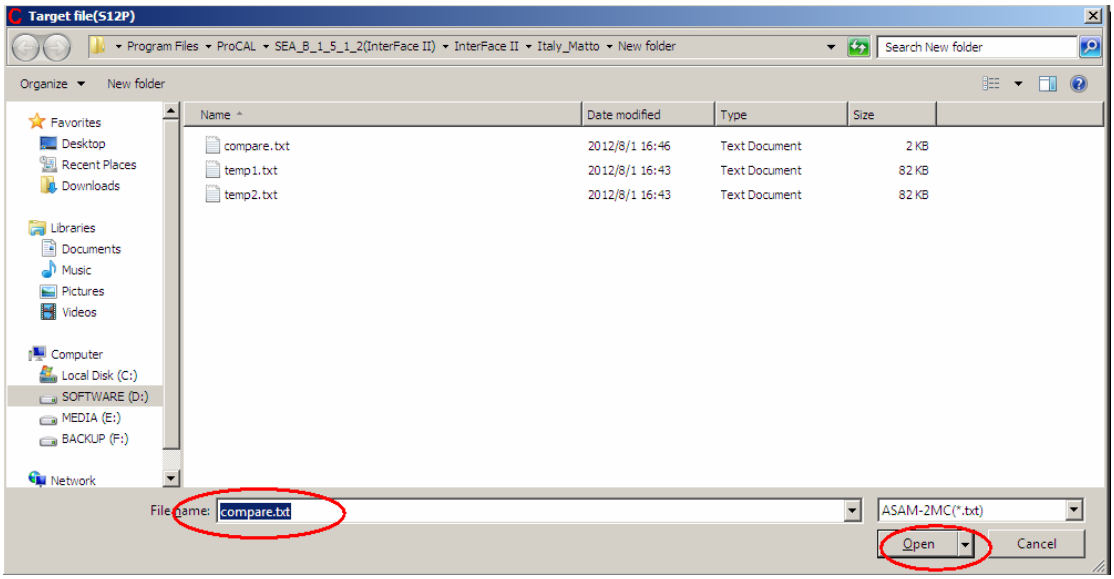


Figure 7.1.20

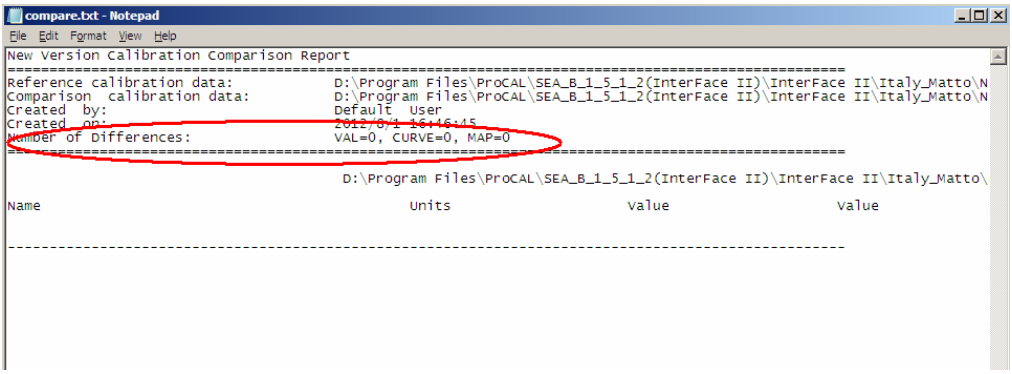

compare.txt - Notepad
File Edit Format View Help
New Version Calibration Comparison Report
Reference calibration data: D:\Program Files\ProCAL\SEA_B_1_5_1_2(InterFace II)\InterFace II\Italy_Matto\N
Comparison calibration data: D:\Program Files\ProCAL\SEA_B_1_5_1_2(InterFace II)\InterFace II\Italy_Matto\N
Created by: Default User
Created on: 2012/8/1 16:16:15
Number of Differences: VAL=0, CURVE=0, MAP=0
D:\Program Files\ProCAL\SEA_B_1_5_1_2(InterFace II)\InterFace II\Italy_Matto\
Name Units Value Value

Figure 7.1.21

If the number is 0, it means copy file successfully, you can use the new saved file to run you bike.

Message: also, you can use above method to copy or compare other files.

7.2 Record Data

ProCAL recorded data is automatically generated file name.

When you press the "start recording", procal will automatically generate a folder for a file name to the current system time, Location to save the record in the ProCAL installation directory folder. The default location is" D:\Program Files\ProCAL\record ".

Figure 7.2.1 The current system time

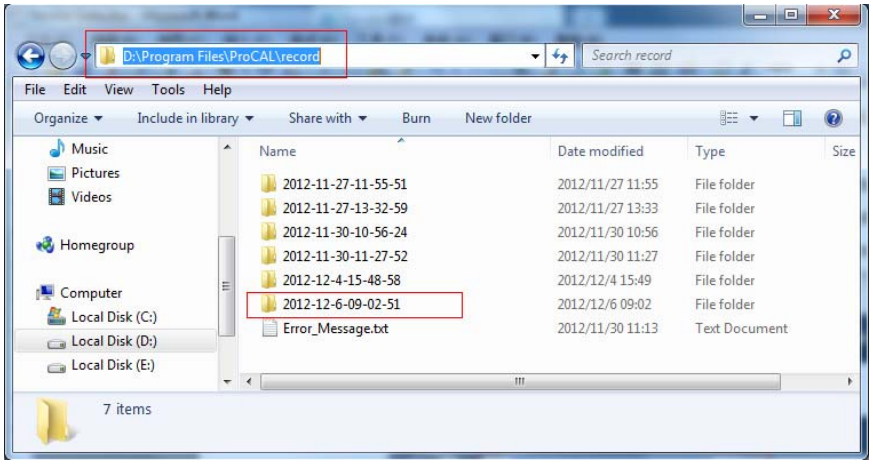


Figure 7.2.2 Recording data generated folder

Open the folder, you can see inside there are three types of CSV files: 20ms, 100ms and syn, they are ProCAL recorded data files. You can use the Data-Analyzer open it to observe.

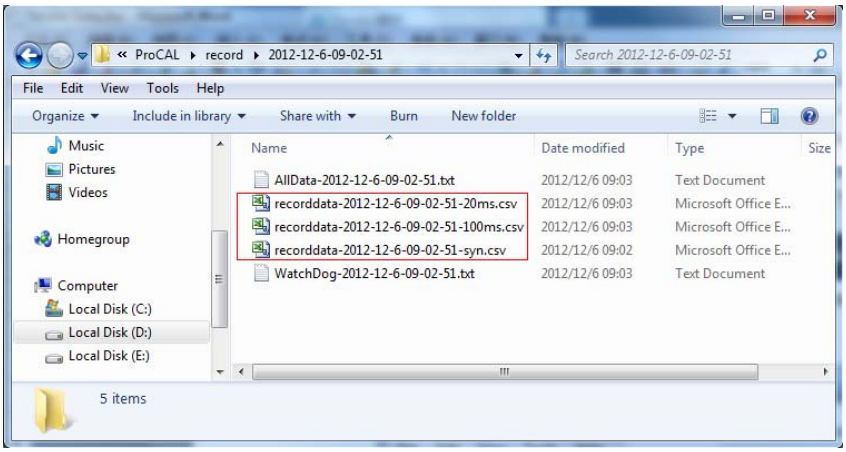


Figure 7.2.3

7.3 Connection ALM to ECU

You need to connect the ALM'S ANout to ProCAL the Performance-Switch input. Follow the following steps to connect:

1) Unplug the ProCAL Performance switch

2) ALM'S ANout (blue line) is connected to the white line of the Performance-Switch

3) ALM'S analog GND (black line) is connected to the Performance-Switch of GND (green line)

4) ANOUT the output voltage from 0V to 5V, and does not need to be modified; it will be varied in accordance with the variation of the lambda.

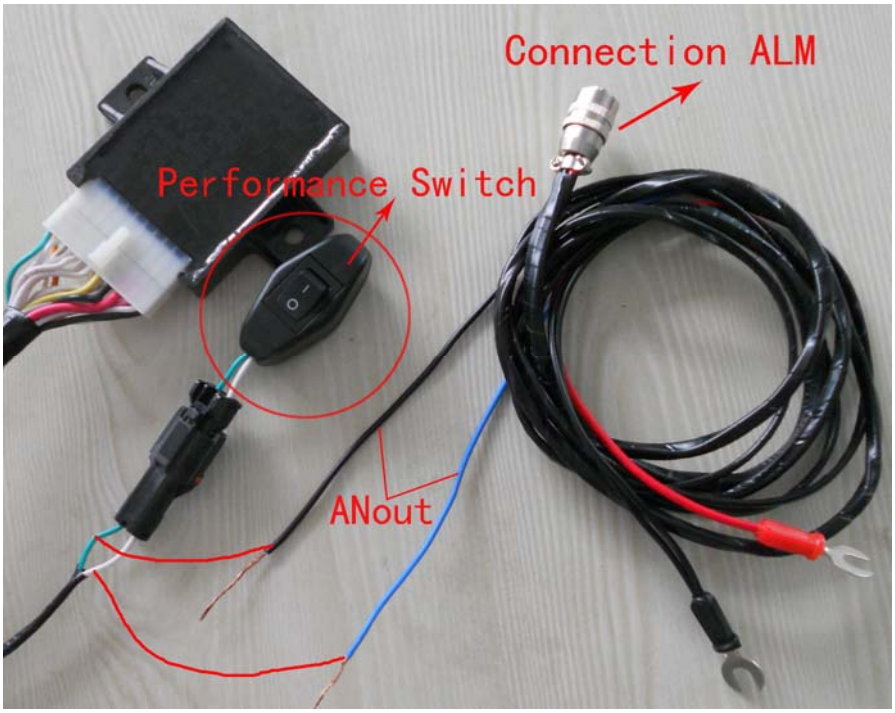


Figure 7.3.1 Connection ALM to ECU

7.4 Auto-tuning Function

Many users confused with tuning the EFI system, and without a fine tuning, sometimes, the EFI system can't bring the best performance.

To make the tuning work easier, we develop a new function "Auto-Tuning". With this function, the work on computer has greatly reduced. You only need to ride your motorcycle on the road.

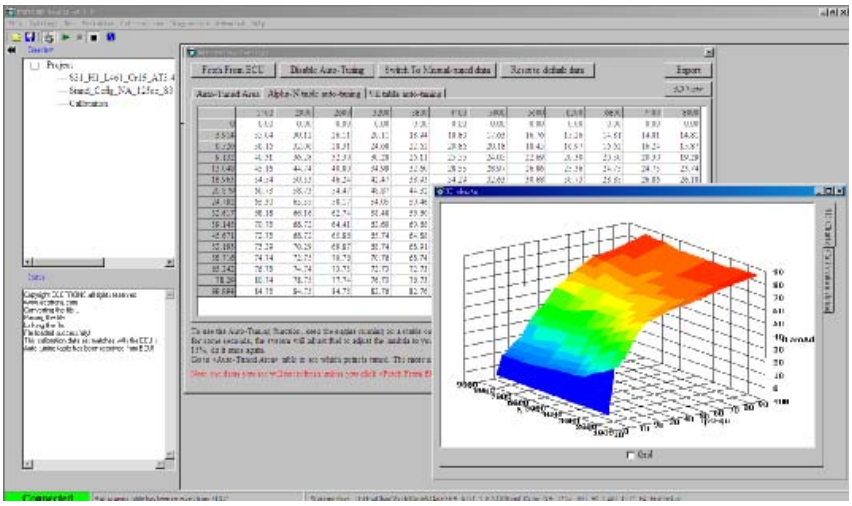


Figure 7.4.1 Auto-tuning

7.4.1 How it works?

First of all, you need to get an ALM. Install it so the ECU can detect the current fuel is rich or lean. Then, when the engine runs, the ECU will adjust the fuel quantity to meet the required performance. Once the ECU feels the result is good, it will be recorded. So the engine can runs better the next time.

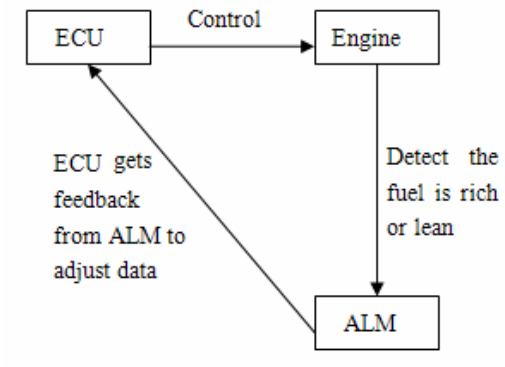


Figure 7.4.2 Auto-tuning schematic drawing

7.4.2 How to use?

7.4.2.1 For common users:

We will give you two CAL files; one is for "auto-tuning", the other one is for "after tuned".

Download the CAL of "auto-tuning" first, then go for a riding, after the engine be fully warmed up,

the ECU will start to tune the data automatically.

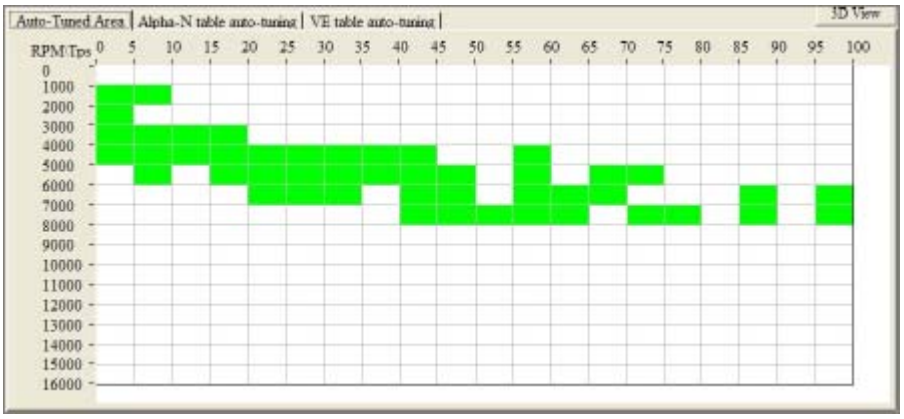
Usually, after all the condition be tuned for 4 or 5 times, the tuning work can be finished. Then download the CAL of "after tuned", you can normal drive your motorcycle.

7.4.2.2 For advance users:

Open the Auto-tuning window in Procal, you can control the auto-tuning function, and get the current tuned data.

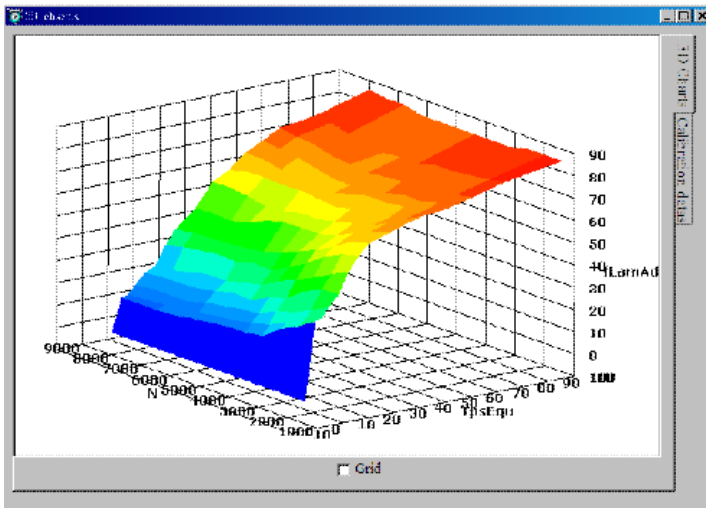
In the first tab, you can see which point you have tuned, the more point be tuned, the better performance you will get.

A typical well tuned engine should be like this:



In the second and third tab, you can see the tuned data. Click "3D View" to view a 3D graph which is more humane.

A 3D graph of Alpha-N table:



You can also switch the data between original data and auto-tuned data, so that you can compare the performance.

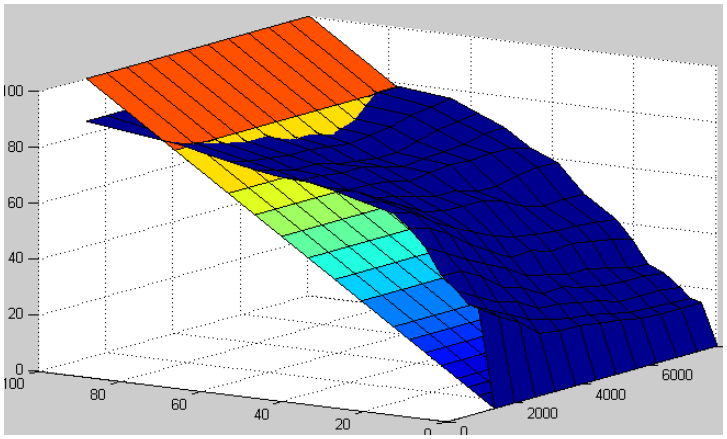
Once you make errors, and you feel the auto-tuned data is even worse than original data, you can reset data.

If you need some advice from us, just export the auto-tuned data, and send it to us via email.

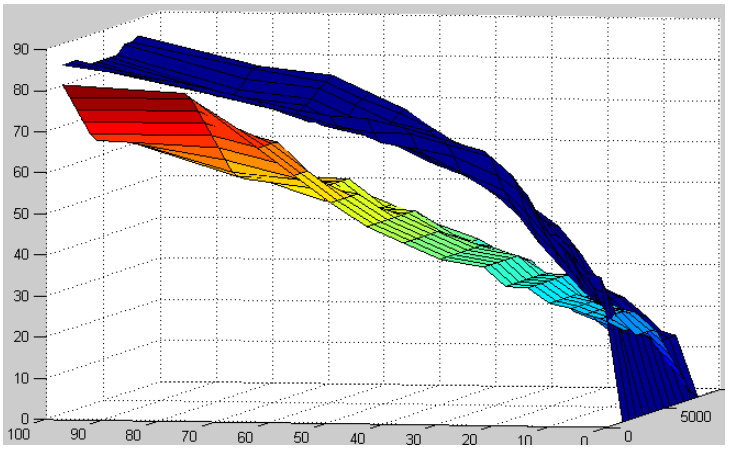
7.4.3 How effective is it?

There's a demo of auto-tuning function, in the pictures below, the blue graph is Alpha-N model data that we get by the dyno which is almost well tuned, and the color graph is manually filled data which is a flat to test the function.

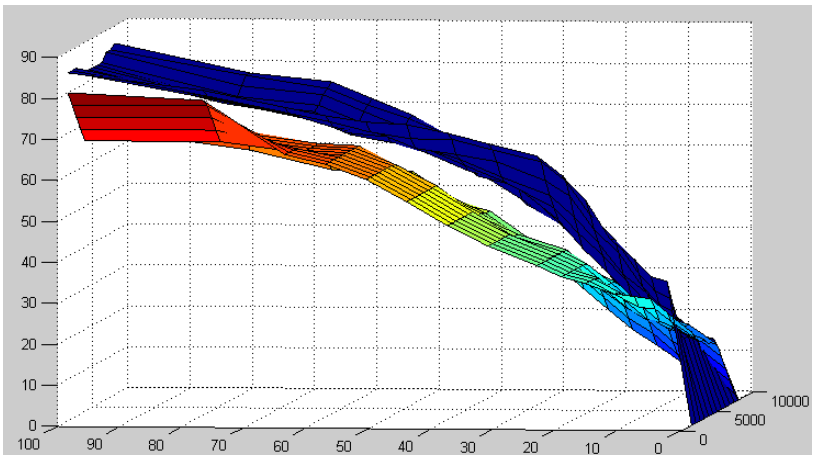
First, let's look at the original data compare with the dyno data:



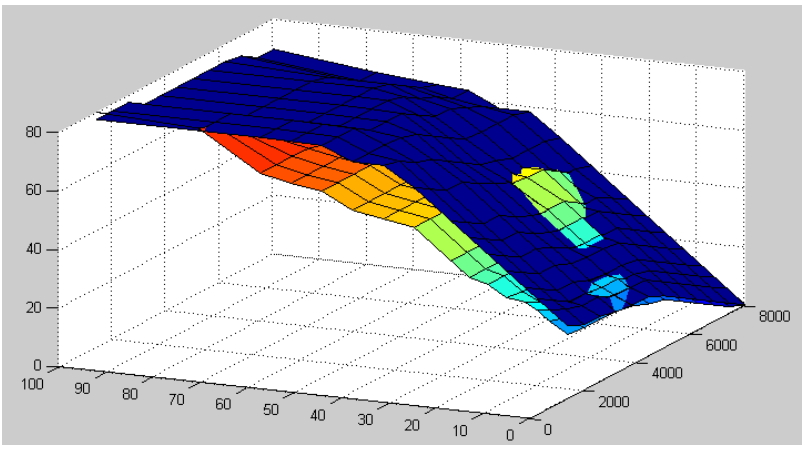
Then, we go for a riding, for about half an hour, and fetch the data, the auto-tuned data become like this:



You can see it get close to dyno data. Then we go for a riding again, and it gets closer:



After 5 times of riding, the data become like this:



So it has already been very like the dyno data.